

INFANT INCUBATOR TRANSPORT BT-100

CONTROLLED COPY

MANUAL BOOK

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WARRANTY

The product described in this manual is warranted against defects in materials or workmanship for two years from the dates of shipment except the following items:

1. All consumable and disposable products are guaranteed to be free for repairing because of defects upon shipment only.
2. Normal drop-in services are not included in the 2-year warranty.
3. Damage caused by improper carrying; for example, drop the device on the ground during transporting or moving.
4. Damage caused by fire, earthquake, flood and other natural calamity.

During the warranty period any defective parts other than those listed above will be replaced at no charge to the customer. This warranty is rendered void and our company cannot be held liable for conditions resultant therefrom if:

1. The customer fails to maintain the unit in a proper manner.
2. Damage to the unit is incurred as a result of mishandling.
3. While the product is changed, maintained or repaired, the customer uses any spare parts, accessories, or fittings not specified or sold by our company.
4. Damage caused by unauthorized dealer.
5. Service is performed by the non-certified service/dealer agency.
6. Enlarge the application scope of this product at will.

SERVICE

For optimal performance, product service should be performed only by authorized and qualified service personnel. Please contact the local agency or the after sales of our company to get more technical information about maintenance.

OPERATING PRECAUTIONS

1. BT-100 Infant incubator (transport) (hereafter referred to as incubator) must be operated by a specially trained operator under the direction of qualified medical personnel who are familiar with the generally known risks and benefit of using an incubator.
2. The incubator is only used for hospital transfer of neonates who need intensive care.
3. The incubator must, after switched on, set a temperature value and preheat, and cannot be put to use before the temperature of the infant compartment achieves thermal equilibrium.
4. The incubator, when starting up to preheat, shall as far as possible take power from power grids or automotive electrical sources so as to maximize the prolongation of the battery's cycle life.
5. The ambient temperature of using the incubator is 20°C~30°C. If the condition fails to be met, please do not use the incubator.
6. The instrument, if abnormal, shall be not put to use until professionals ascertain and solve the problems.
7. While the instrument is working, the operator must pay constant attention to the sufferers, and monitor and record their temperature at certain times in the transport to check if they have abnormalities such as overcooling or overheating.
8. The instrument needs regular check and maintenance. Whenever the instrument is found to have abnormalities and failures, please give an immediate notice to our after-sales service sector or our authorized maintenance providers. Be sure not to make maintenance and detection by those other than our authorized personnel.

9. Exposure to direct sunlight or other radiant heat sources will heat up the incubator, but will not start its over-temperature warning function. Thus, the incubator shall be kept away from direct sunlight and radiant heat sources in use.
10. The incubator in use shall be kept away from the environment with anesthetic gases and other inflammable and explosive materials.
11. The incubator shall be kept away from the environment of strong electromagnetic fields.
12. The equipment susceptible to magnetic field interference shall not be placed near the incubator, for the latter may cause interference to them.
13. The incubator is not furnished with purifying equipment that can improve the air quality. To ensure the air quality in the incubator, the air quality of the ambient environment where the incubator is used shall be up to standard.
14. The constant temperature cover of the incubator shall not be opened any time when the patients are still in the incubator. Any necessary contact with the patients can be achieved by the front door and the operating port.
15. When the front door or the side door is opened, the temperature shown on the temperature display window of the incubator may be not the incubator's real temperature, so that do not let the front door or the side door remain open for a long time when the incubator is in normal use.
16. All long hooks of the doors shall firmly catch on the groove to avoid accidental opening.
17. To make infants safe, do not leave them in the incubator alone without attendance while the door is opened.
18. Placement of other auxiliary equipment in the incubator may cause changes in the air flow pattern, and thus have impact on the temperature's consistency and variability.
19. If there are miscellaneous articles in the air circulation passage (for example children's toys, or their clothes and quilts or rugs), the air course may be

blocked, which may even endanger infants' safety and affect the incubator's performance, so that such cases shall be avoided.

20. Movement of the incubator shall be made by at least two stronger men.
21. To move the incubator needs to unplug the power cord that supplies power. Power shall be supplied by a battery so as to ensure safety.
22. The incubator, in use, shall as far as possible take power from power grids or automotive electrical sources so as to maximize the prolongation of the battery's cycle life.
23. To avoid accidents, be sure the wires or perfusion tubes or breathing pipes to the infant mattress are long enough to make the movement of crib easy.
24. The incubator, in moving, shall be handled with care without hit and knock, so as to avoid being damaged or causing other dangers.
25. If the incubator is put to first use, or an infant is successfully transported, or there is dirt in it, the incubator shall undergo thoroughly cleanness and disinfection.
26. The incubator shall be cleaned with neutral detergent and disinfectant of national registration, or else the incubator will be partially damaged. The detergent and disinfectant shall be used as directed by the manufacturer.
27. Please use the skin temperature sensor or other fittings, consumables that our company provides, or the safety performance of the incubator will be impaired.
28. When the incubator's service life becomes due, continued use of it will result in errors or failure to reach the original performance index.
29. The service life of the incubator is 8 years. When it expires, the incubator and its fittings shall be disposed according to local laws. They shall not be discarded at random, or they will cause damage to local environment.

ELECTRICAL PRECAUTIONS

1. To ensure grounding reliability, connect the AC power cord only to a properly grounded with single-phase and 3-wire hospital grade or hospital use outlet. Do not use extension cords. If any doubt exists for grounding, please use the storage battery.
2. Make sure the power supply is compatible with the electrical specification shown beside the socket of the power supply of the incubator and the appropriate IEC60601-1 and/or IEC60601-1 harmonized national standard.
3. Before the maintain and change the fuses, must pull out the 3-pin plug from mains outlet.

OXYGEN PRECAUTIONS

1. Must use hospital oxygen.
2. Abusing of supplemental oxygen may result in serious aftereffects which include blindness, brain damage, even death. Therefore, keeping to the main doctor's direction strictly and monitoring the oxygen supplement condition for the patient regularly.
3. When supplementing the oxygen, calibrated oxygen analyzer shall be used for monitoring the oxygen concentration. Related operating please refer to the oxygen analyzer operating manual and related document
4. Oxygen feeding may increase the noise level inside the hood.
5. As oxygen use increases the danger of fire auxiliary equipment producing sparks should not be place in an incubator.
6. Do not use combustible material like aether, alcohol etc. because once even a little aether, alcohol, or other combustible material mixed with oxygen in the incubator, it'll cause fire.

7. Regularly check the gas and the oxygen transporting pipeline to see if they are eroded or broken

REGULAR SAFETY CHECK

To ensure that the Infant incubator (transport) is in good working order, a regular safety check shall be paid to the incubator, which is specifically as follows:

1. Check if the signs listed in the manual are clear and legible. Those which are not acceptable shall be treated by replacement and alike.
2. Check if the area of power plug terminals is clean; if not, clean it up.
3. The check in the following respects shall be made once every 12 months by personnel with sufficient professional knowledge and practical experience. Those which are not acceptable shall be kept in repair:
 - a. Check mechanical structure and functional completeness.
 - b. Test the equipment's impedance between the protective earth terminal and any part that is protectively earthed shall not exceed 0.1Ω .
 - c. Test the equipment's earth leakage current, which shall not exceed $500\mu\text{A}$ under normal condition and not exceed $1000\mu\text{A}$ in single fault condition.
 - d. Test the equipment's touch current, which shall not exceed $100\mu\text{A}$ under normal condition and not exceed $500\mu\text{A}$ in single fault condition.
 - e. Test the equipment's patient leakage current, which shall not exceed $100\mu\text{A}$ in alternating current under normal condition and not exceed $10\mu\text{A}$ in direct current.
 - f. Test the equipment's patient leakage current, which shall not exceed $500\mu\text{A}$ in alternating current in single fault condition and not exceed $50\mu\text{A}$ in direct current in single fault condition.
 - g. Test the equipment's patient leakage current (mains voltage on the applied part), which shall not exceed $5000\mu\text{A}$ in single fault condition.
 - h. Test the equipment's patient auxiliary leakage current, which under normal

condition shall not exceed 100 μA in alternating current and 10 μA in direct current, and which in single fault condition not exceed 500 μA in alternating current and 50 μA in direct current.

- i. Other parameter indices in the parameter table listed in the manual.

EXPLANATION OF TERMS

I Terms and Definitions

1. Air temperature control

The air temperature in the baby compartment is automatically controlled by an air temperature sensor according to the control temperature set by the operator.

2. Skin temperature control

The air temperature in infant compartment, automatically controlled by the skin temperature sensor stuck on the infant's skin according to the control temperature set by the operator.

3. Transport air temperature

The temperature of the air at a point 10 cm above the center of the mattress surface in the compartment.

4. Control temperature

The temperature set on the temperature controller (the temperature as required by the infant compartment).

5. Skin temperature sensor

The sensing device intended to measure the infant skin temperature.

6. Skin temperature

Temperature of the skin of the infant at a point on which the skin temperature sensor is placed.

7. Temperature uniformity

The difference of the average temperature measured at the 4 points 10cm above the crib mattress surface from the average incubator temperature;

8. Warm up time

The control temperature set to 12°C above ambient temperature, the time for the incubator temperature to rise by 11°C is measured in air temperature control mode.


























9. Product life

The time from its issuing to its scrap disposal;

10. Attention, important, caution and warning

- A. **Attention:** "Attention" messages are marked beside the operation, conditions or procedures which may be neglected or misunderstood to draw enough attention. "Attention" messages can be also used to clarify contradictory or perplexing facts.
- B. **Important:** Similar to the "Attention", it is used in circumstances where much more emphasis shall be laid.
- C. **Caution:** Used in circumstances where much more attention needs to pay. If the marking fails to be carried out according to the operating instructions emphasized in this way, the equipment will be damaged or destroyed or carry out incorrect operation.
- D. **Warning:** "Warning" messages are used to prompt dangers or risks resulted from operation, cleaning and maintenance of the equipment. Failure to carry out in accordance with the operation instructions emphasized in this way will cause life danger or serious personal injury to operators or patients.

II Symbols

	Attention, consult accompanying documents		Dangerous voltage
	On (power)		Off (power)
	"On" (only for a part of equipment)		"Off" (only for a part of equipment)
	BF application part		Weight limit sign
	Audio paused key		Keypad lock
	Down key of temperature set		Up key of temperature set
	Heating output proportion indication		Set key over 37°C
	electricity quantity indication of battery	SN	Product number
	Manufacturing date		Protective earth (ground)
	Low priority alarm		High priority alarm
	Alternating current		Direct current
	Fuse		Read manual book
	Operation instruction		Do Not Dispose

Chapter I GENERAL INTRODUCTION

This manual is a guide about installation, commissioning, operation, cleaning and maintenance of BT-100 Infant incubator (transport) manufactured. We are entitled to not be responsible for the behavior in service of incubators that fail to follow the manual to conduct installation, commissioning, operation, that fail to abide by the manual to undertake cleaning and maintenance and that use unauthorized parts for maintenance.

1.1. Overview

This transport infant incubator integrates advanced techniques in such disciplines as clinical medicine, mechanics, computer automatic control and sensor to develop for premature infants and ill infants an admirable environment which has purified air, suitable temperature and humidity and resembles the mother's womb. The temperature of infant compartment in the infant incubator allows being set according to the doctor's advice, and the infant's skin temperature, infant compartment temperature and humidity are digitally displayed. If the infant's skin temperature and infant compartment temperature exceed the normal value or has other abnormalities, there will be sound and light alarm (alarm functions for power interruption, fan stoppage, sensor faults, incubator over-temperature, skin over-temperature, deviation of incubator and skin temperatures from set value) to ensure the equipment's reliability and safety, thus providing an excellent environment for infants in transport.

1.2. Intended use

Used for body temperature recovery, infusions, rescue and transfer for premature infants, critically ill infants and invalid infants.

1.3. Product Composition

The incubator is mainly composed of such parts as double-layer constant cover, crib

bracket, control cabinet, oxygen cylinder holder, infusion support, light and trolley.

The double-layer thermostatic cover, made of quality organic glass, together with the crib bracket constitutes the infant compartment.

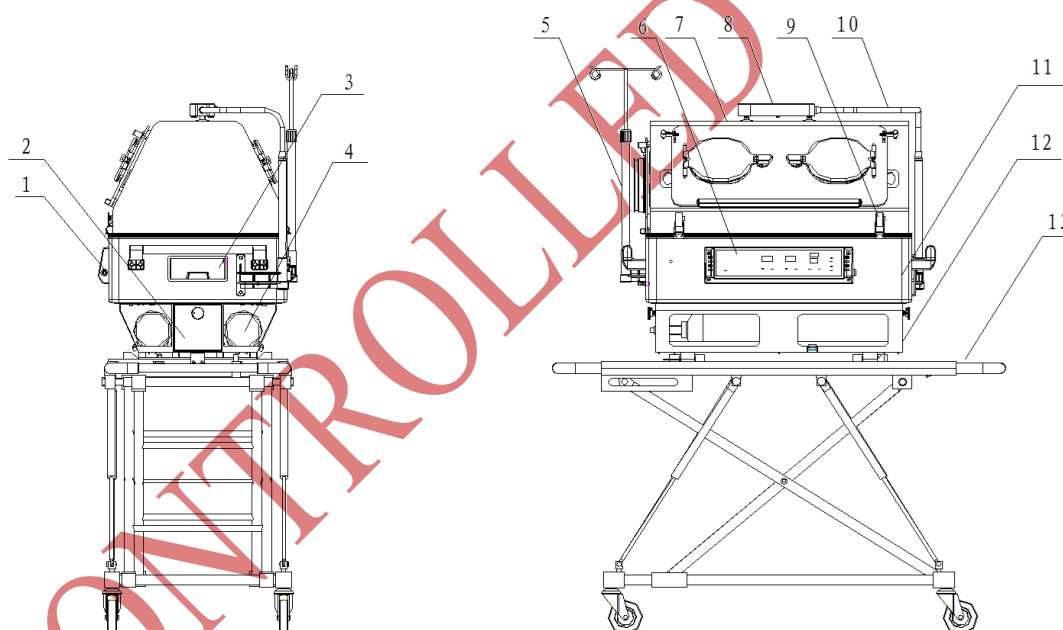
Under the crib bracket is the control cabinet. The control cabinet contains centrifugal fan, heater, control panel, display panel, power supply, battery, etc. All of them together form the heating and humidification system.

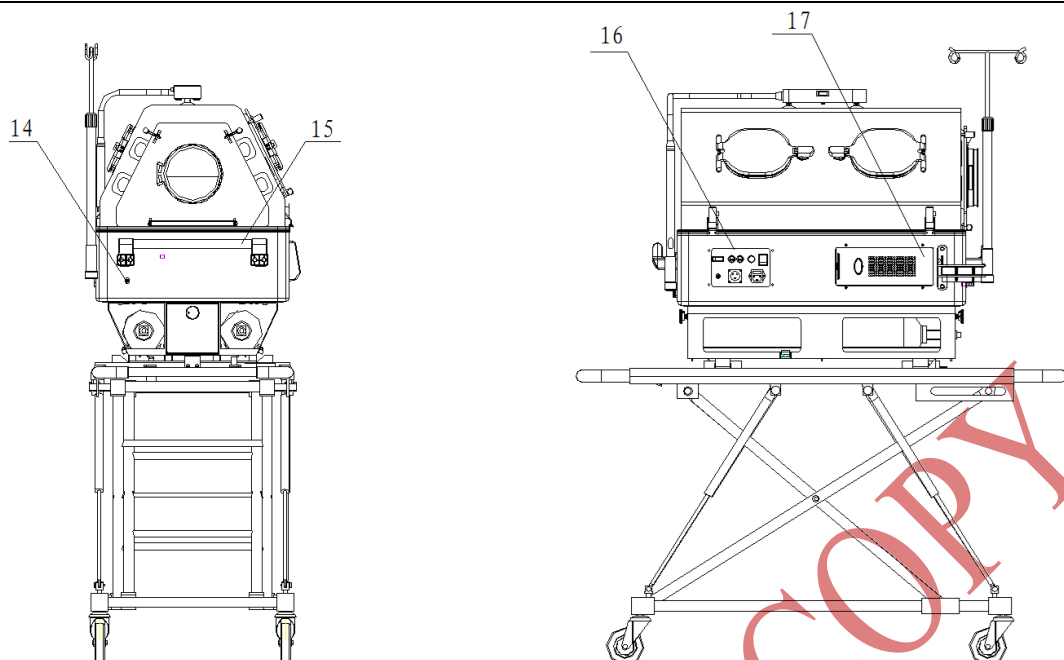
Under the control cabinet is the oxygen cylinder holder, which is used to hold and fix oxygen cylinder.

Beneath the oxygen cylinder is the trolley.

The trolley of the Infant incubator (transport) is an optional part.

Major parts of the incubator can be referred to the figure below:





- | | | |
|-----------------------------|-------------------------|----------------------------|
| 1. Skin temp sensor socket | 2. Article box | 3. Humidifying box |
| 4. Oxygen cylinder | 5. Infusion support | 6. Operation panel |
| 7. Constant temp cover | 8. Light | 9. Hang buckle |
| 10. Light post | 11. Control cabinet | 12. Oxygen cylinder holder |
| 13. Trolley | 14. Oxygen therapy port | 15. handrail |
| 16. Switch and socket panel | 17. Air filtering vent | |

Part name	Description
Infusion support	<p>A bracing component of Infant incubator (transport), which is expected to hang infusion bottle.</p> <p>The maximum load capacity of this component is 20N.</p>
Infant compartment	<p>A device used to place infants. An infant compartment is composed of thermostatic cover, crib and etc. the thermostatic is presented as double-layer cover, which is buttoned up on the incubator bracket and fixed by a hitch.</p> <p>The maximum load capacity of the crib is 100N.</p>
Control cabinet	An important component of Infant incubator (transport). A

	<p>control cabinet is composed of shell, centrifugal fan, heater, air passage, air passage thermal baffle, air temperature sensor, control panel, display panel, switching power supply, rechargeable lithium ion battery and etc. All of these construct the heating control system.</p> <p>The control cabinet's shell is made of ABS material, and it shall be not hit or knocked in use.</p>
Light	<p>A lighting component of Infant incubator (transport). The light adopts LED (light-emitting diode), so that it is highly bright and energy-efficient. The switch has two modes of brightness control. There is a sucker on the light, which can attach to the thermostatic cover of the incubator as necessary.</p>
Oxygen cylinder holder	<p>A fixed part of Infant incubator (transport) and used to place and fix oxygen cylinder. The middle of the oxygen cylinder holder is the article compartment, which will be opened by pressing its knob and turning it 90°.</p>
Trolley	<p>An auxiliary transport device. The trolley is equipped with 4 universal wheels. The trolley is adjustable in height.</p> <p>The trolley is an optional part. There are two types for user's needs:</p> <p>Type 1: short</p> <p>Type 2: big</p>

1.4. Outside dimension and weights

- (1) Infant Incubator (transport) (L*W*H) : 900*580*730 (mm)
- (2) Trolley (L*W*H) : 1370*530*790 (mm)-type 1: small
: 1890*550*890 (mm)-type 2: big
- (3) Main body weight : 54.8 (Kg)
- (4) Trolley weight (net) : 26.25 (Kg)-type 1: small

: 38.30 (Kg)-type 2: big

(5) Crib (L*W*H)

: 624*310*25 (mm)

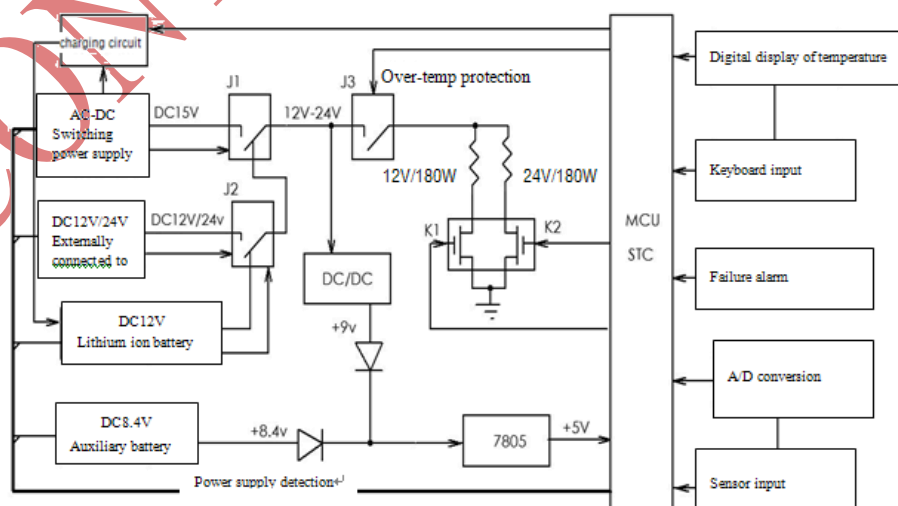
1.5. Product Principle

1.5.1. Principles of constant temperature and air convection circulation system

The infant incubator is divided into two layers: the upper and the lower, and has openings at both ends lengthwise. Thus, it forms inside an upper-lower air convection circulation system. The lower layer is furnished with a centrifugal fan and electric heating tube while the upper layer with thermostatic cover and easily stretchable crib. Driven by the centrifugal fan, the heat circulates along a direction from upper to lower and from left to right so as to achieve temperature equilibrium. In the space of negative pressure of the centrifugal fan a square hole is made. The hole allows a little bit air outside the infant incubator into the incubator after filtered. The filtered air goes out through the outlet at the top of the organic glass thermostatic cover. It then forms a circulation with the air outside the incubator. Achieve the purpose that CO₂ does not exceed standard. Under the crib is humidifying sponge. When the incubator is in use, the sponge fully absorbs distilled water. The electric heating tube evaporates the water in the sponge into air to form a convection circulation system, thus meeting the purpose of humidification.

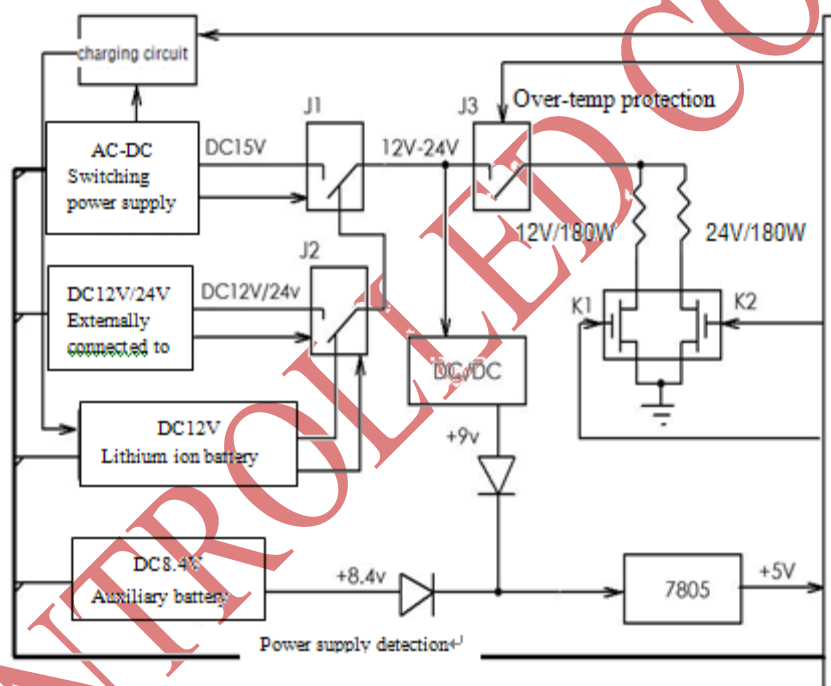
1.5.2. Circuit Principle

Design block diagram of main circuit



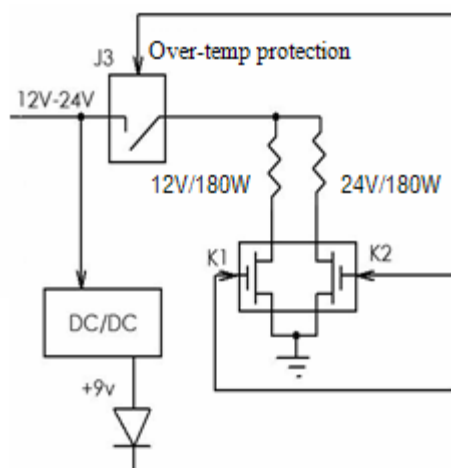
A. Power supply

The equipment is externally fed by AC220/240V power supply, with DC 24V or 12V input, and internally equipped with a rechargeable lithium ion battery cell for short-time emergency use. The priority level of power supply source is AC220/240V--DC24V/DC12V--DC12V, which can be converted by DC-DC (DC12-24V input, DC9V output) into working power supply DC9V for mainboard. To avoid the change of power supply mode causing vibration to power supply, a zero-clearance switching circuit made up of auxiliary Ni-MH battery (DC8.4V/0,17AH) is set up to structure a system power supply with power sense circuit.



B. Control method of heaters

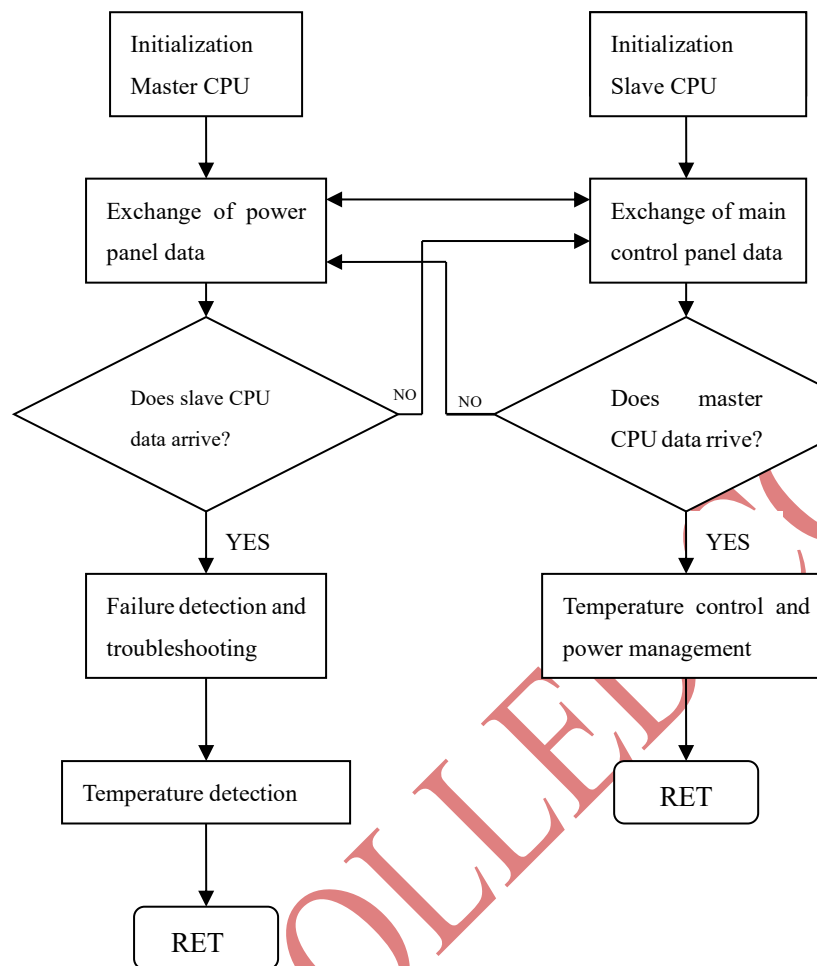
As shown in the figure below, there are two modes of supply voltage: DC24V and DC12V, and thus two heaters are employed. The power supply is connected to the common terminal of the heaters by the normally open contact of the protective relay. When MCU detects the existence of DC24V, the MOS tube of K2 is used as temperature detect switch; and when MCU detects the existence of DC12V, the MOS tube of K1 is used as temperature detect switch.



C. Mainboard circuit

The master control system's core MCU employs STC single chip microcomputer, which features strong resistance to static electricity (ESD protection) and interference, high speed (as high as 80MHz) and high reliability. To allow the system to reduce working frequency in a steady way, it is set to be 11.05924MHz. Such working frequency can meet both our demand for speed and our requirement of system stability. The system adopts dynamic scanning display and keys scanning to meet MCU port amount. The temperature information, sampled by MCU and after data processing, is subject to digital display and relevant control respectively. The heating circuit shall be of DC12V/DC24 direct control, (or DC12V/DC24V PWM control). An independent temperature protection circuit shall be set up for over-temperature protection of the system.

1.5.3. Software program block diagram



Chapter II CIRCUIT PARAMETER TABLE

Power input:

- | | |
|--------------------------|--------------------------|
| 1. AC power supply input | : AC 220 / 240V, 50/60Hz |
| 2. DC power supply input | : DC12V 20A, DC24V 10A |
| 3. Total power input | : ± 368 W |

Battery:

- | | |
|------------------------------------|---|
| 4. Main battery | : DC12V 40AH, Li-ion battery |
| 5. Auxiliary battery | : DC8.4V 0.17AH, Ni-MH battery |
| 6. Battery cycle | : not less than 500 times |
| 7. Battery's charging time | : 12 hours |
| 8. Battery's discharge time | : not less than ± 2 hours (set to be 36°C hold time, ambient temperature 15°C) |
| 9. Battery's discharge time | : not less than 60min (set to be 36°C heating-up and hold time, ambient temperature 15°C) |
| 10. Main battery dimension (L*W*H) | : 330*130*42 (mm) |
| 11. Main battery weight | : 3.4(Kg) |

Operational environment:

- | | |
|--|--|
| 12. Operating temperature range | : 0~40°C (attention: the set temperature shall be 3°C higher than ambient temperature) |
| 13. Limit operating temperature range | : +0~40°C |
| 14. Operational environment humidity | : 30%~75%RH |
| 15. Operational environment atmospheric pressure | : 700~1060 hPa |
| 16. Working environment air velocity | : ≤ 1 m/s |
| 17. Storage temperature range | : -40~+55°C |
| 18. Storage environment humidity | : $\leq 95\%$ RH |
| 19. Storage environment atmospheric pressure | : 500~1060 hPa |

Equipment control:

- | | |
|---|-------------|
| 20. Controlled temperature range in air temperature mode | : 25~38°C |
| 21. Special operation in air temperature mode | : 25~38°C |
| 22. Controlled temperature range in skin temperature mode | : 32~37,5°C |
| 23. Special operation in skin temperature | : 32~37,5°C |

mode

- 24. Incubator temperature deviation* : $\leq 1^{\circ}\text{C}$
- 25. Incubator temperature uniformity* : $\leq 1,5^{\circ}\text{C}$
- 26. Warm-up time* : ± 60 min
- 27. Difference of tested incubator temperature from actual temperature* : $\leq 0.7^{\circ}\text{C}$
- 28. Air velocity at bed surface* : $\leq 0.3\text{m/s}$
- 29. Noise in the equipment's thermostatic cover* : $\leq 65\text{dB (A)}$

Equipment's circuit:

- 30. Equipment's service life : 8 years
- 31. Power interruption alarm : Yes
- 32. Air temperature sensor circuit break alarm : Yes
- 33. Air temperature sensor short circuit alarm : Yes
- 34. Skin temperature sensor circuit break alarm : Yes
- 35. Skin temperature sensor short circuit alarm : Yes
- 36. Fan failure alarm : Yes
- 37. Air temperature deviation alarm : Yes (difference: $\pm 3.0^{\circ}\text{C}$)
- 38. Skin temperature deviation alarm : Yes (difference: $\pm 1.0^{\circ}\text{C}$)
- 39. Under-voltage and overvoltage alarm : Yes (AC:AC/DC converted to $V < 11\text{V}$; DC: $< 10.5\text{V}$ & $> 26.5\text{V}$)
- 40. System self-check alarm : Yes (If System EEPROM has failure, system ROM failure alarm will sound; lithium battery voltage is abnormal or over-temperature. Switching power supply voltage is abnormal, and the automotive electrical source abnormal)
- 41. Silence key : Yes (when pressed, if the failure is not removed within 5min, the sound will restart.)
- 42. Air temperature display range : $20\sim 45^{\circ}\text{C}$
- 43. Skin temperature display range : $20\sim 45^{\circ}\text{C}$
- 44. Temperature display resolution : 0.1°C
- 45. Skin temperature sensor precision : $\leq 0.7^{\circ}\text{C}$
- 46. Air temperature sensor precision : $\leq 0.7^{\circ}\text{C}$
- 47. Battery cell capacity indication : Yes (indication by 4 partitions, each indicating 25%. The charging course is displayed by scanning)

48. Heating power indication	: Yes (indication by 10 partitions, each indicating 10%)
Equipment volume/ weight:	
49. Equipment's main body (L*W*H)	: 900*580*730 (mm ³)
50. Trolley (L*W*H)	: 1370*530*790 (mm ³) 1890*550*890 (mm ³) big
51. Main body weight	: 69 (Kg)
52. Trolley weight	: 24.5Kg (small) 38.30 (big)
53. Maximum load of infusion pole	: 20N
54. Maximum load of crib	: 100N
55. Crib mattress size (L*W*H)	: 624×310×25 (mm ³)
Other parameters:	
56. CO ₂ concentration in incubator	: < 0.5% measured according to Article 104, IEC60601-2-20:
Factory default setting:	
a. Temperature control mode	: Air temperature control
b. Set value of air temperature	: 32°C
c. Set value of skin temperature	: 34°C

Chapter III INSTALLATION

3.1. Overview

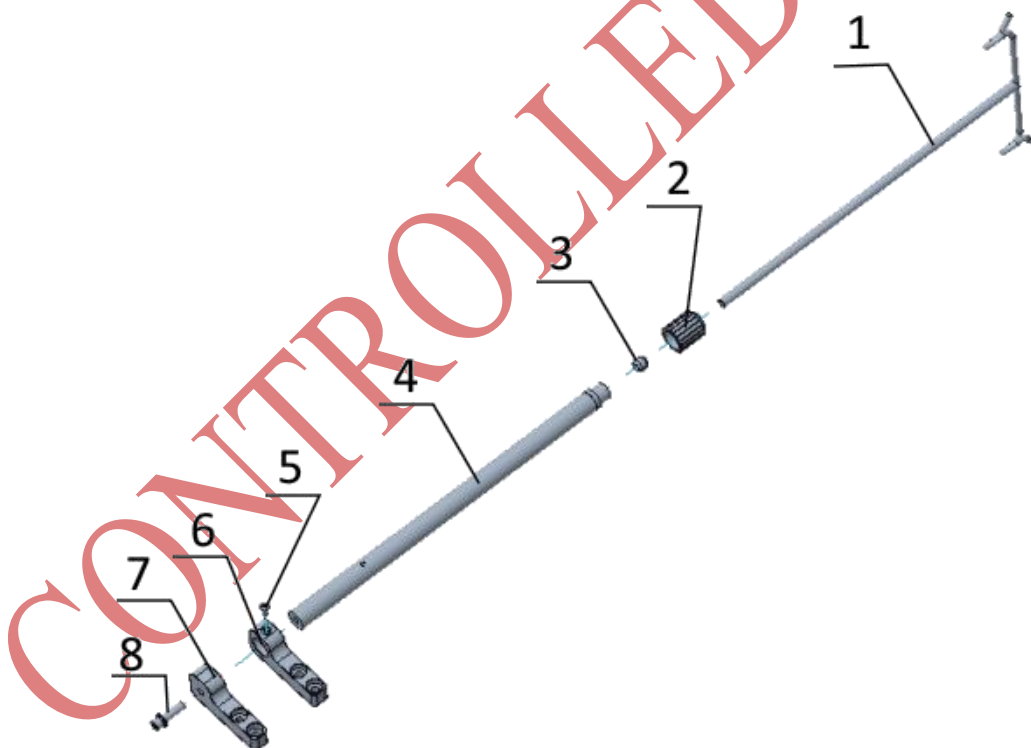
This section is the guide about the installation of incubators.

3.2. Unpacking

Normally, the Infant incubator (transport)'s main body is totally packed, and needs no installation. The light and infusion support however are packed separately. Thus, you shall handle the different packages gently to avoid damage to the parts and fittings of the incubator.

3.3. Assembling of infusion support

This component is mainly used to hang infusion bottles for ill infants. It is mainly composed of the parts below. The detailed structure is shown as the figure below.



Name of the parts

- | | |
|------------------|---------------------|
| 1) Infusion hook | 5) I.V. pole |
| 2) Lock nut | 6) Bottom plug |
| 3) Lock head | 7) Infusion support |
| 4) Top plug | 8) Lock screw |

Notice: The largest loading capacity is 20N

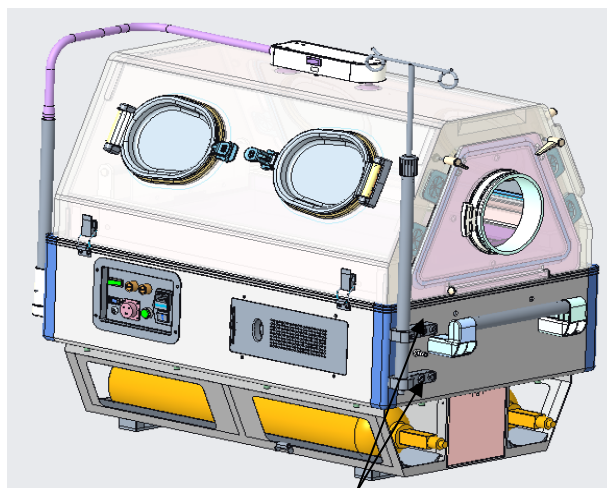
Installation steps of the parts

- A. Screw M6 clamp nut to the screw thread of the infusion hook.
- B. The infusion hook is screwed in the movable infusion pole and then reinforced by the clamp nut. **Make sure it is tightened with no possibility of getting loose.**
- C. The clamp nut and lock head pass through the movable infusion pole to insert it into the center hole in the fixed link of infusion support.
- D. After the fixed link of infusion support is adjusted to proper height, the locknut is screwed to it.



Figure of Assembled Infusion Support

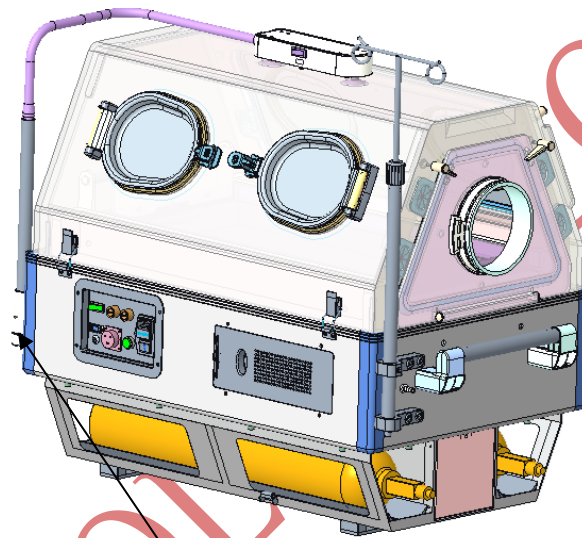
- E. When assembled, the infusion support is fitted to the fixing hole at the left of the Infant incubator (transport), as shown in the figure below.



Install the I.V pole to the incubator with 4 inside M8 screws

3.4. Installation of light component

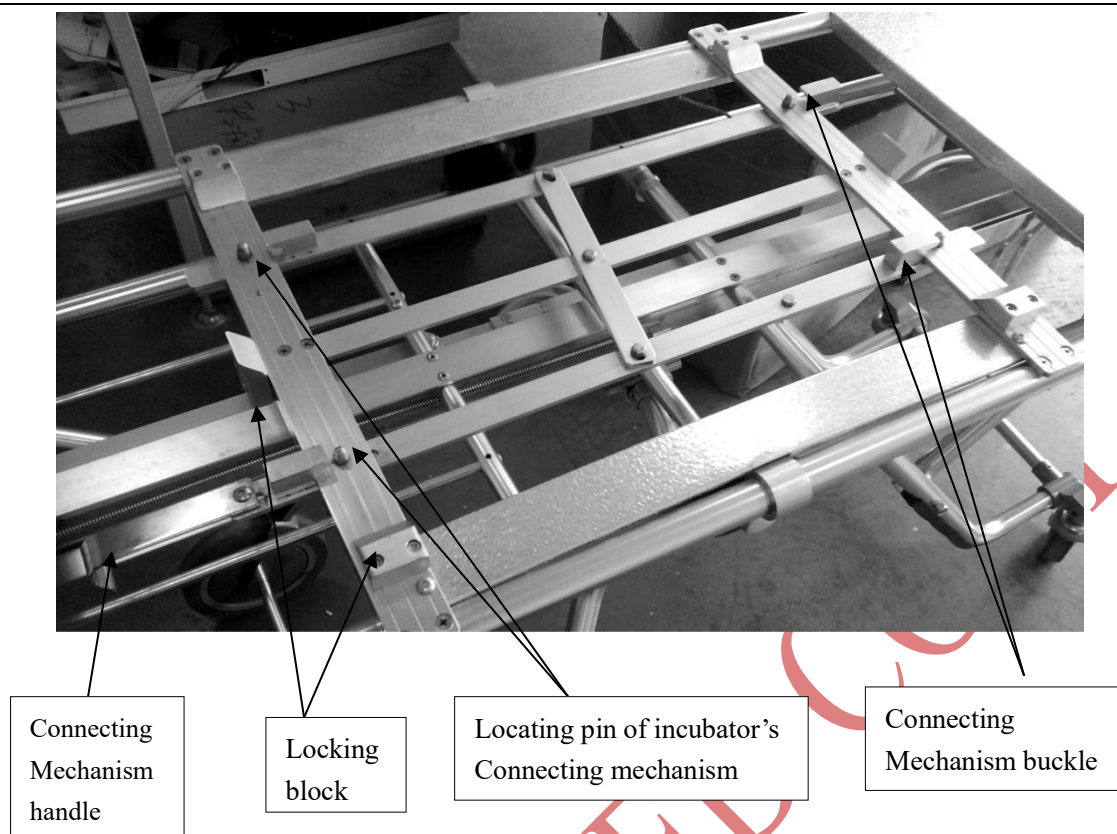
- A. The light components are clockwise fitted to the fixing hole at the right of the Infant incubator (transport). Insert the light components into the retaining bracket. And tighten the lock screw of M3X12.
- B. The flexible metallic tube of the light is bent to the shape as shown in the figure, making the light aim at the crib in the Infant incubator (transport).
- C. Press the light sucker downwards to attach it to the incubator's thermostatic cover top and then fix the light.



Retaining bracket

3.5. Installation of Infant incubator (transport) and trolley

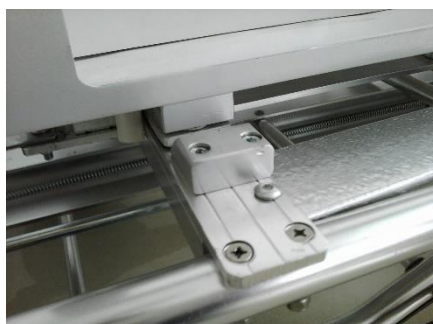
The Infant incubator (transport) is connected with the trolley by pins and buckles. For the trolley matching with the Infant incubator (transport), the connecting mechanism is as shown in the figure below.



- A. Pull the connecting mechanism handle of the incubator trolley to separate the connecting mechanism buckle from the locating pin.
- B. The incubator is lifted by two men, with its legs targeting at the trolley's locking block and the trolley's locating pin at the locating hole in the Infant incubator (transport) 's leg, and then the incubator is gently put down.
- C. Release the connecting mechanism handle to let the incubator's connecting mechanism buckle lock the incubator's leg, thus finishing the connection and fixation.

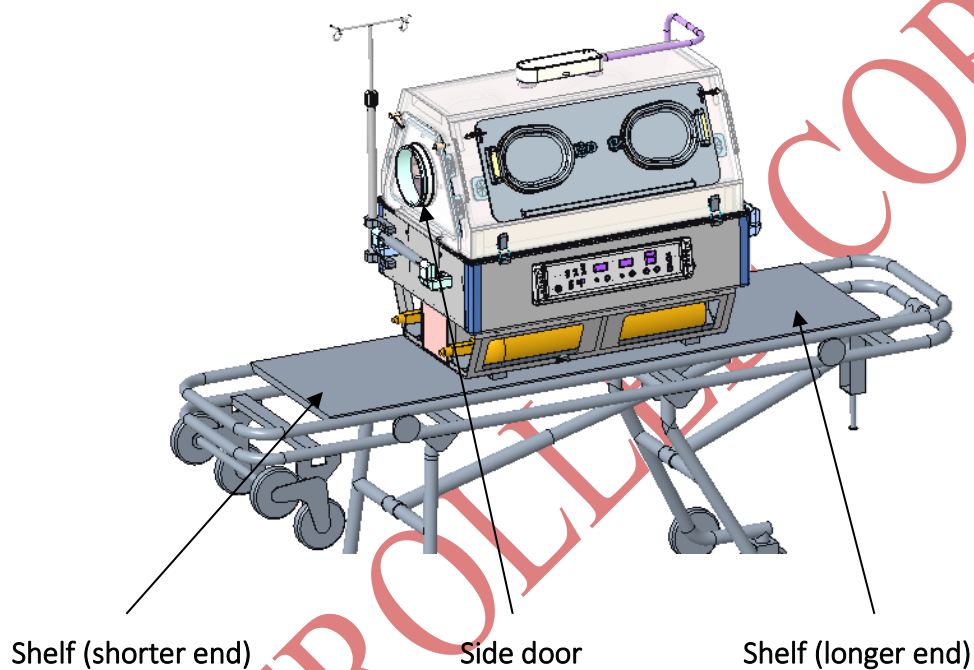
The finished connection is as shown in the figure below.

Attention 1: The Infant incubator (transport) trolley we have produced has a limit to its bearing capacity, so that other therapeutic equipment or monitoring equipment (if any) on the trolley shall not exceed 50Kg.

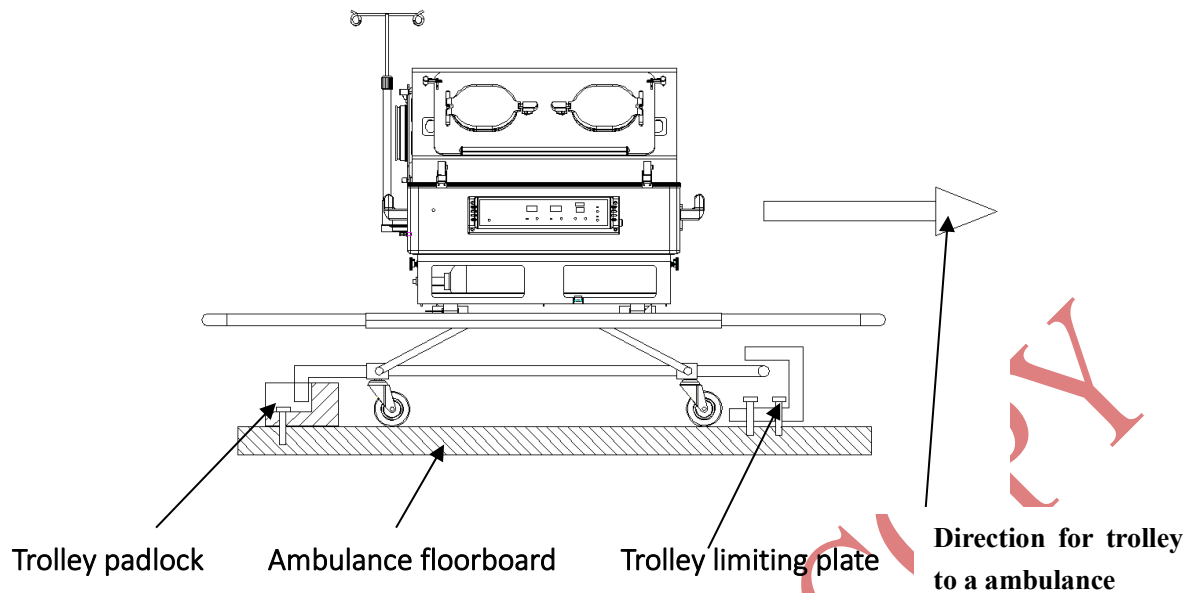


Attention 2: The connection of our company's Infant incubator (transport) with type 1 (short) trolley has no directional requirements.

The connection of the Infant incubator (transport) with type 2 (extended) trolleys do have directional requirements. The correct direction is that the direction of Infant incubator (transport)'s side door (the direction of oxygen input port) shall be consistent with that of the shorter shelf of the (extended) trolley. Incorrect connection will result in failure to install oxygen inhalator of oxygen cylinder. The placement is as shown in the figure below:



Attention 3: Short incubator trolleys (type 1) have no permanent connecting device with ambulances. As for extended trolleys (type 2), they are designed to directly get inside the ambulance with no need to take down the incubator. Our company provides two fittings to fix the trolley on the ambulance, which are installed as shown in the figure below:

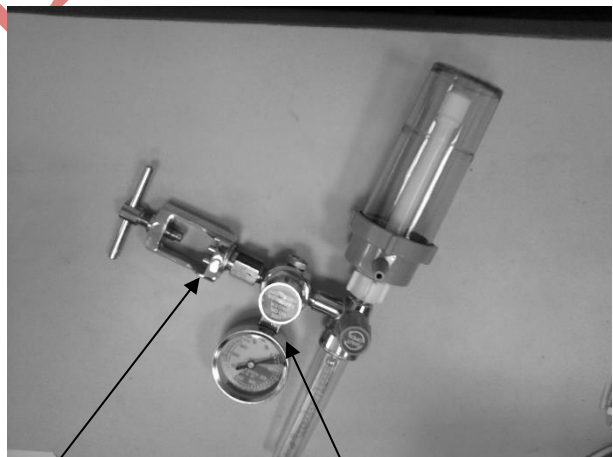


3.6. Installation of oxygen cylinder and pressure regulating valve

- A. The oxygen cylinder is put into its protecting bag, with the bag mouth bound carefully.
- B. Slide the oxygen cylinder into the slot of its holder.
- C. When the oxygen cylinder is to be taken down, press down the locking switch of the lace catch and then pull out the catch. Thus the oxygen cylinder can be opened.



Oxygen cylinder
adapter locating slot



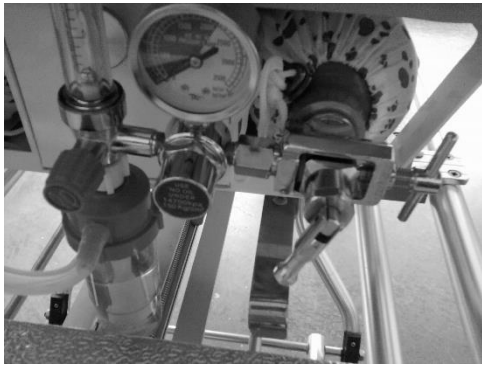
Oxygen inhalator
Locating pin

Oxygen inhalator
Pressure gauge

- D. An oxygen inhalator matching with the oxygen cylinder shall be fitted on. Specifically, the locating pin of the oxygen inhalator is targeted at the locating hole of the oxygen cylinder adapter, and the oxygen inhalator's pressure gauge at the outlet of the oxygen cylinder adapter. Then the fixing threaded handle is tightened. Finally, the

oxygen cylinder is turned to make the pressure gauge at an easily visible position.

- E. The oxygen cylinder latch catch is pressed down to lock the oxygen cylinder.



Assembled oxygen inhalator figure



Oxygen cylinder catch

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Chapter IV OPERATION OF INFANT INCUBATOR (TRANSPORT)

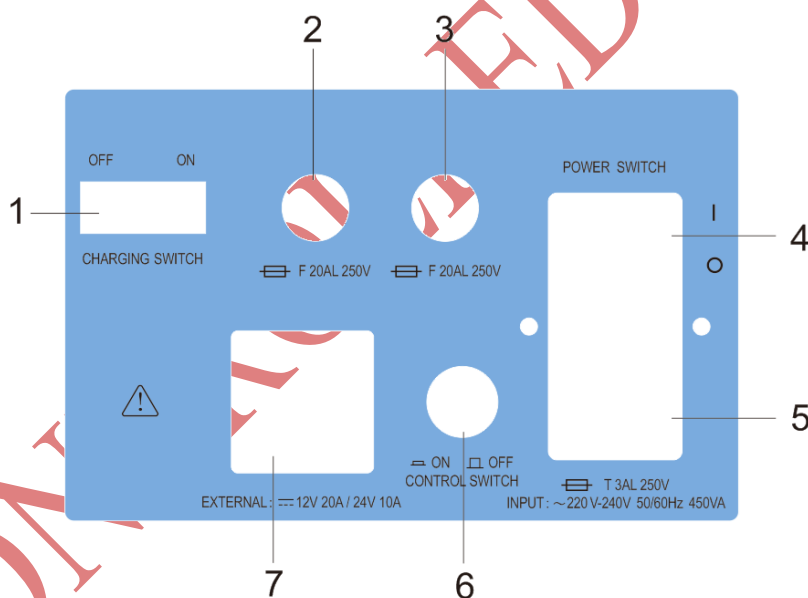
4.1. Overview

This section involves a guide about operation of BT-100 Infant incubator (transport). This incubator has temperature control (air temperature mode, skin temperature mode) system and is furnished with humidification and oxygen therapy functions.

4.2. Power supply source connection and switching control

4.2.1. General introduction to power control panel

The incubator has its master switch of general supply and sockets of charge power supply switch at the side of its control cabinet, beneath the incubator's handle, as shown in the figure:



- 1) Recharging switch
- 2) Fuse holder
- 3) Fuse holder
- 4) Power switch
- 5) Mains socket
- 6) Controller switch
- 7) Automotive electrical source socket

4.2.2. Operation instructions of parts of power control panel

A. Controller switch

While the incubator is connected to mains or an automotive electrical source and the power supply is normal, if the power master switch and the controller switch both are opened, the incubator works well in whole (including display, heating, lighting, charging, etc.). If the power master switch is opened while the controller switch is closed, the incubator only has charging function work well, with other functions shut down.

B. Fuse holder

F 20AL250V refers to F-type fuse tube, 20A L 250V.

When the fuse is damaged and needs to change, a screwdriver is used to screw down anticlockwise the fuse cover, thus to take down the fuse for renewal. Then it is screwed up clockwise.

C. Power master switch

While the incubator is connected to mains or an automotive electrical source and the power supply is normal, if the Power master switch and the controller switch both are opened, the incubator works well in whole (including display, heating, lighting, charging, etc.). If the Power master switch is closed the incubator will have no function work whether the controller switch is opened or closed.

If the Power master switch of the incubator is opened, while the automotive electrical source and battery supply are closed, the power interruption alarm will be activated.

D. Mains socket

Mains socket is a single phase triple socket. When connected to the equipment, make sure the ground wire of mains is grounded reliably. This Infant incubator

(transport) can use such two types of mains: AC 220/240V 50/60Hz

E. Automotive electrical source socket

This Infant incubator (transport) can use such two types of automotive electrical source: DC 12V and DC 24V. The locknut shall be locked after the power plug is inserted. It is required for reliable connection and firm locking.

F. Lamp socket

DC12V power supply is provided for supply to the lighting.

G. Charger switch

The charger switch is dedicated to charging up Infant incubator (transport) batteries. While the incubator is connected to mains or a car power and the Power master switch is opened, the charger switch is opened to charge up Infant incubator (transport) batteries.

When the battery is being charged, the 4 level battery indicator lights will light up in turn and circulate repeatedly, and the charging indicator under the battery indicator light will be on.

When charging is stopped, the 4 level battery indicator lights on the panel indicate the current battery level. (Note: there are a total of 4 battery level indicator lights, which indicate the current battery level in 5 grades, that is, 0%, 25%, 50%, 75%, 100%). The charging indicator under the battery indicator light will be off.

When the Infant incubator (transport) is using the battery, the battery indicator lights on the panel indicate the battery level, providing basis for clients of deciding whether the charger switch needs to be opened to charge up the battery or not.

Description of battery charge indicator:

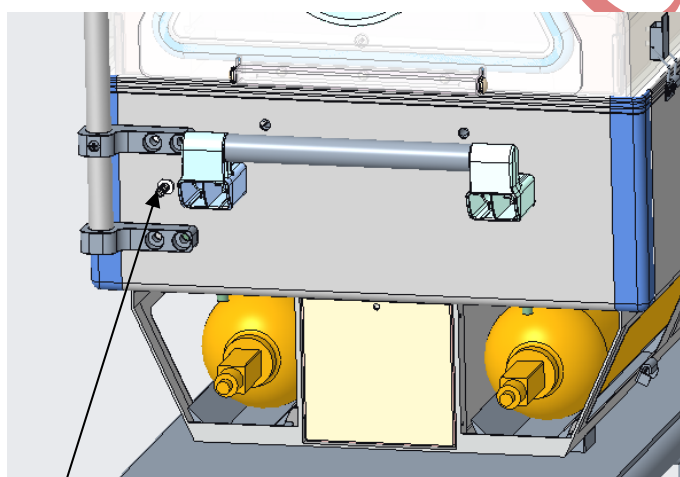
The charge indicator will be green when the charging switch is opened to charge up the battery. When the battery is fully charged, and the charging stops itself or the charging switch is closed, the charge indicator turn off.

4.2.3. Priority level of power supply source connection

The Infant incubator (transport) adopts a total of 3 kind power supply modes: mains, automotive electrical source and battery.

The priority of these 3 kind power supply modes is: mains, automotive electrical source and battery. That is to say, the system is able to automatically detect power supply systems. When the system detects the mains, it will automatically activate the mains; if there is no mains, when the system detects an automotive electrical source, it will activate the automotive electrical source; if the system detects neither mains nor automotive electrical source, but only battery, it will activate the battery for power supply.

4.2.4. Oxygen port, skin temperature sensor port



Oxygen port

A. Oxygen therapy port

When the oxygen cylinder is equipped with an oxygen inhalator, one end of the oxygen therapy catheter is connected to the inhalator, and the other end to the oxygen port. The oxygen therapy catheter shall be inserted hard into the bottom of the port so as to ensure a good seal and avoid air leakage.



For oxygen therapy, a calibrated oxygen analyzer shall be employed to test the oxygen concentration. The operation can be referred to oxygen analyzer manual and similar documents.

B. Skin temperature sensor port



Skin temperature sensor port

Used for Infant incubator (transport)s to insert skin temperature sensor. A check shall be given to the adapter of the skin temperature sensor to make sure it is clean before inserted. It shall be cleaned if there is dust so as to avoid alarm due to bad contact.

C. Use skin temperature sensors correctly

In skin temperature mode, when a skin temperature sensor is employed, be sure to ensure reliable contact between the sensor probe and the patient's skin. If the patient is lying on his back, the probe shall be placed between the xiphoid and navel at the patient's abdomen, avoiding the liver; if the patient is lying prone, the probe shall be placed on the patient's back, preferably at the kidney; as for the patients lying on side, where to place the probe is subject to the attending doctor's directions.

Attention:

1. The probe of the skin temperature sensor cannot be used as rectal thermometer.
2. The skin temperature sensor must be disinfected before reused once an ill infant is transported.
3. Do not place the skin temperature sensor under the patients.

Warning

1. When the skin temperature mode is in use, be sure the skin temperature sensor's probe is in reliable contact with the suitable part of the patient. If the probe separates from the patient, the temperature it measures is not the expected patient's skin temperature, but maybe the air temperature or the mattress's surface temperature. This, as a result, will cause the patient to absorb excessive heat or lose heat sharply, thus doing grievous harm to ill infants' body.
2. The temperature measured by a skin temperature sensor is just the patient's skin temperature, not the actual body temperature. Therefore, skin temperature sensors cannot be used as thermometer. The patients must regularly undergo measurement of body temperature by a thermometer to check if they have obvious signs of fever or hypothermia.
3. Do not cover the skin temperature sensor's probe with articles such as rug and diaper, or the accuracy of the temperature measurement will be affected.

4.2.5. Difference of power master switch, controller switch and charging switch

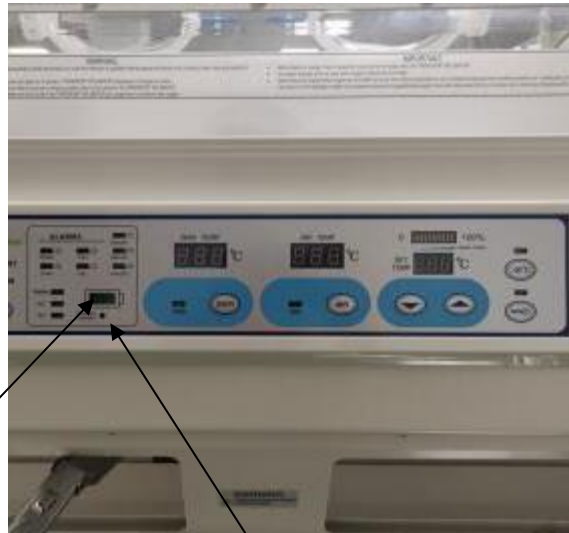
When a mains or an automotive electrical source is connected, opening the Power master switch is the prerequisite for this Infant incubator (transport) to work.

When the Power master switch is opened, the Baby incubator (transport) cannot work normally before the controller switch is opened, including display, lighting, heating, etc.

While the incubator is connected to a mains or a car power and the Power master switch is opened, if the battery needs to be charged, please open the charger switch. When the battery is fully charged, please close the charger switch timely to protect the battery and the incubator's charger.

If there is no infant to be transferred when the battery begins to be charged, clients

can close the controller switch for the purpose of energy saving and protection of heater and circuit board.

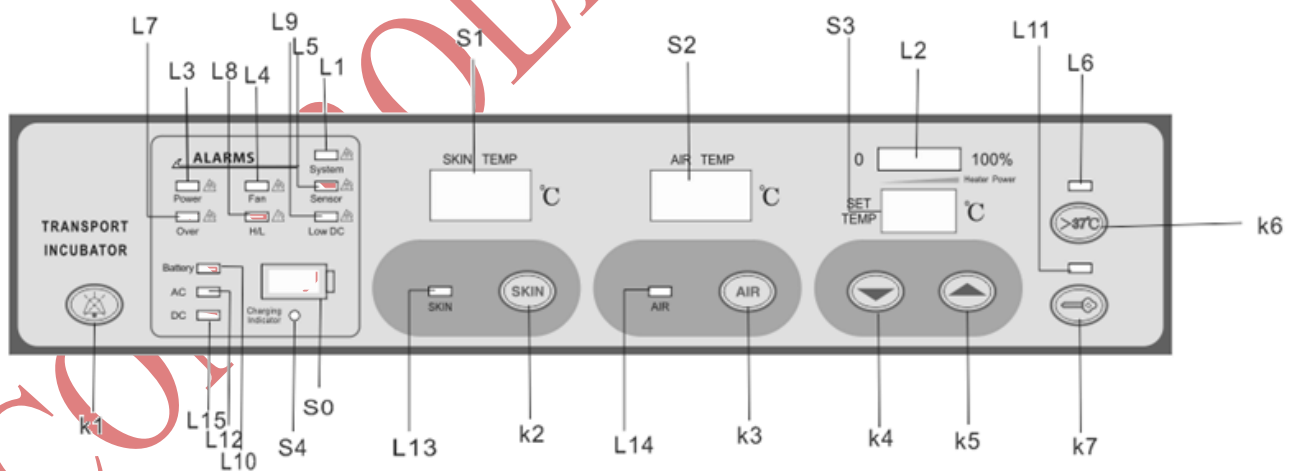


Battery indicator light

charge indicator

4.3. BT-100 panel operation instructions

4.3.1. Key and display



Information Key and figure

- L1-System alarm
- L2-Heating power indication
- L3-Power failure indication
- L4-Fan failure

-
- L5-Sensor fault
 - L6->37°C indication
 - L7-Over temperature
 - L8-temperature deviation
 - L9-Low voltage indication
 - L10-Battery power mode
 - L11-Lock indication
 - L12-AC power mode
 - L13-Skin temperature control mode
 - L14-Air temperature control mode
 - L15- Externally connected to DC 12/24 power mode
 - S0- Battery indicator
 - S1-Skin temperature display
 - S2-Air temperature display
 - S3- Temperature setting display
 - S4- Changing indicator
 - K1-Silence key. Pressing this key once when the alarm sounds can keep silence for 5 minutes.
 - K2-Skin temperature control key. Once it is pressed, pressing K2 can set skin temperature control mode and modify skin temperature set value (in concert with the up/down key).
 - K3- Air temperature control key. Once it is pressed, pressing K3 can set air temperature control mode and modify air temperature set value (in concert with the up/down key).
 - K4-Down key.
 - K5-Up key.
 - K6->37°C Key. When the set value reaches 37.0°C, pressing K6 once can set value exceed 37.0°C.
 - K7-Key. All key operation (except the Silence key) cannot works unless K7 is pressed

to unlock.

Example 1: Setting of 36.0°C in air temperature mode

Press K7 (key) → press K3 (air temperature control key) → press K4 (down key) or K5 (up key) to adjust the set value to be 36°C → press K7 (key) to finish the setting.

Example 2: Setting of 36.0°C after switched to skin temperature mode

Press K7 (key) → press K2 (skin temperature control key) [switch to skin temperature mode for this operation] → press K4 (down key) or K5 (up key) to adjust the set value to be 36°C → press K7 (key) to finish the setting.

Example 3: Open overriding mode for temperature setting

Press K7 (key) → press K6 (overriding mode control key) → press K4 (down key) or K5 (up key) to adjust the set value to be the specified temperature → press K7 (key) to finish the setting.

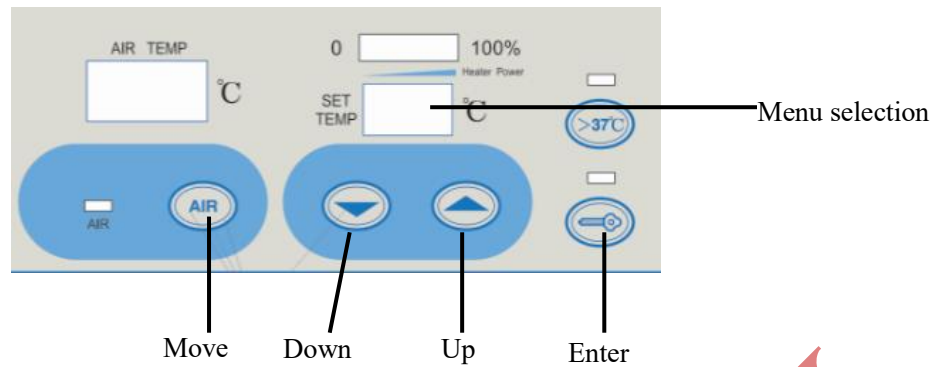
Warning



The Infant incubator (transport) is a complicated microcomputer-based system, so that the operation of the setup menus in the following 4.3.2 to 4.3.5 subsections must be performed by trained professionals of our company. Besides, in the course of operation, be sure there are no infants or articles involving the infants in the incubator. The company shall be not responsible for any setup error due to arbitrary entry into setup menus, and adverse effects caused thereby.

4.3.2. Operation method of entering setup menu

Tips: To enter the setup menu must pass a 3-digit password (123), as shown in the key definition below.



Keep pressing the enter key for some seconds → menu selection screen displays “--”, press the Move key and corresponding parts flicker → select the 3-digit password in concert with Up/Down key → press the enter key after selection → the menu selection screen displays “Pr.” if the password is correct (not displayed if the password is incorrect) → pressing Up/Down key can select menu’s functions “PR.1”, “PR.2”... “PR.6” → after selection, press the enter key → enter the function options and press the Up key to select functions (see details of menu function in section 3) → press the Key to back to the menu selection screen → press the enter key again to quit the menu for auto boot (warm boot).

Steps of entering the menu:

Press	Select 1	Move	Select2	Move	Select3	Enter

4.3.3. Details of setup menu functions

- PR.1-Menu 1; adjust errors in air temperature and skin temperature.
- PR.2-Menu 2; view or adjust the second thermal cutout temperature.
- PR.3-Menu 3; fan alarm test
- PR.4-Menu 4; over-temperature test 1
- PR.5-Menu 5; over-temperature test 2
- PR.6-Menu 6; restore to initial data

4.3.4. Function description of setup menu and its operation method

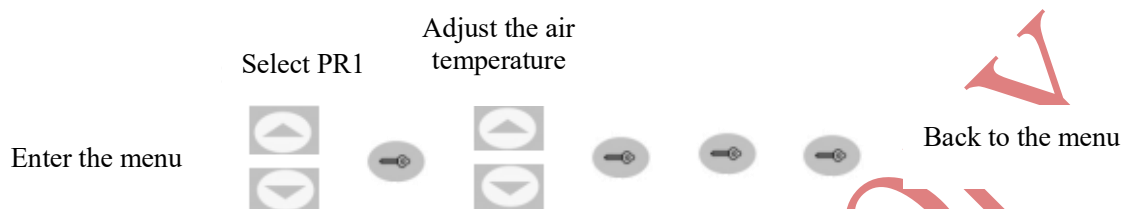
❖ **PR.1** → function 1-by directly pressing the Key, select in turn to correct air temperature error (P20); skin temperature error (P20), and incubator over-temperature error (U10).

- The range of air temperature error P: 0.0-4.0°C; default: 2.0°C±2.0°C

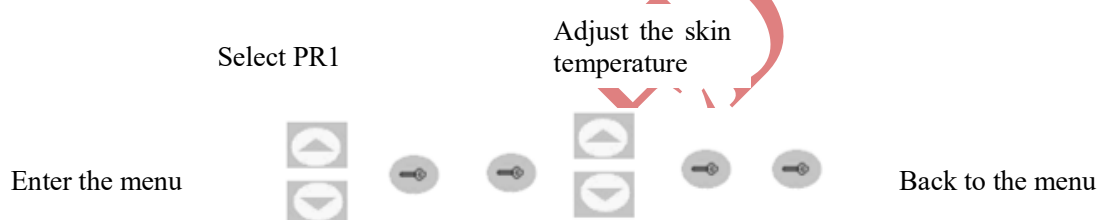
adjustable.

- The range of skin temperature error P: 0.0-4.0°C; default: 2.0°C ± 2.0°C adjustable.
- The range of incubator over-temperature error: 0.0-2.0°C; default 1.0°C ± 1.0°C adjustable.

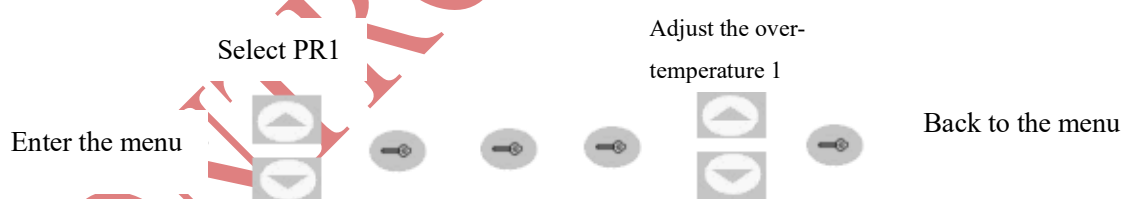
A. Steps of adjusting air temperature error:



B. Steps of adjusting skin temperature error:

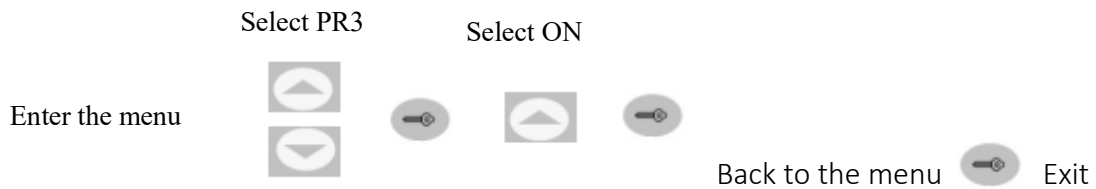


C. Steps of adjusting over-temperature error 1:



- ❖ **PR.2**→function 2—Observe the temperature at the second thermal cutout point directly by air temperature display. To change the temperature at the second thermal cutout point needs to act in concert with the power panel W1's potentiometer.
- ❖ **PR.3**→function 3—select "On" to simulate fan's locked-rotor state; select "OFF" to realize fan's actual running state.

Operation steps:



When “On” is selected to simulate fan’s locked-rotor state, the fan alarm light will be on, and the alarm buzzer sounds.

- ❖ **PR.4**→function 4-Select “On” to simulate air temperature’s out-of-control state 1; (Check over-temperature alarm) select “OFF” to get air temperature’s normal control state.

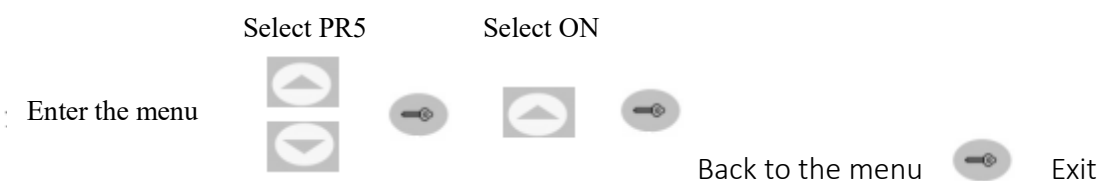
Operation steps:



Set the air temp to 35°C, enter the menu PR4. When “On” is selected to simulate incubator temperature’s out-of-control state; the over temp indicator light is twinkling. When incubator temperature rising above 38°C, it will alarm with sound and light and turn off the heater power automatically; restart the machine when the temperature recovers. The incubator will be out of test state.

- ❖ **PR.5**→function 5-Select “On” to simulate incubator temperature’s out-of-control state 2; (Check the second over-temperature cutout alarm) select “OFF” to get incubator temperature’s normal control state.

Operation steps:



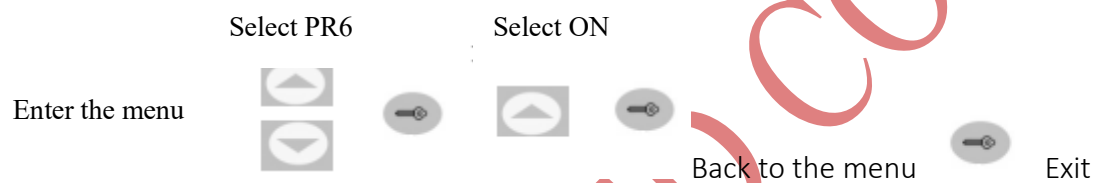
Set the air temp to 37.5°C, enter the menu PR5. When “On” is selected to simulate

incubator temperature's out-of-control state; The "over temp" indicator light is twinkling.

When the air temperature is about 39°C and 39.5°C, it will alarm successively with sound and light and turn off the heater power in 39.5°C automatically. Restart the machine when the temperature reduces to normal temperature and the incubator will be out of test state.

❖ **PR.6**→function 6; restore to initial data Air temperature set value-32.0°C Skin temperature set value-34.0°C Incubator P-2.0 Skin P-2.0 Incubator U-1.0

Operation steps:

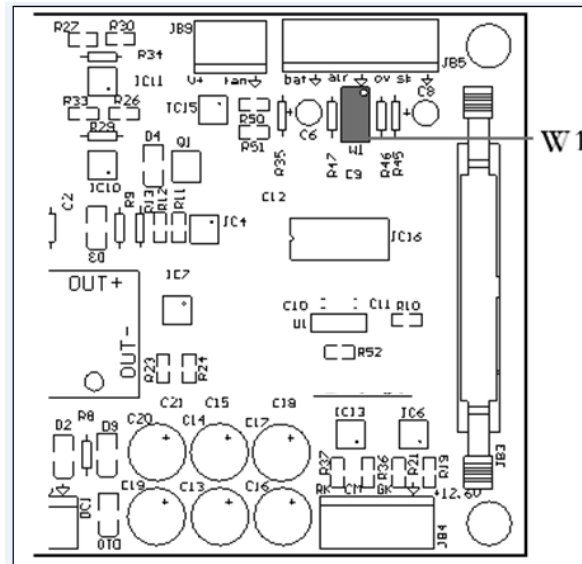


4.3.5. Operation steps of exiting menu operation

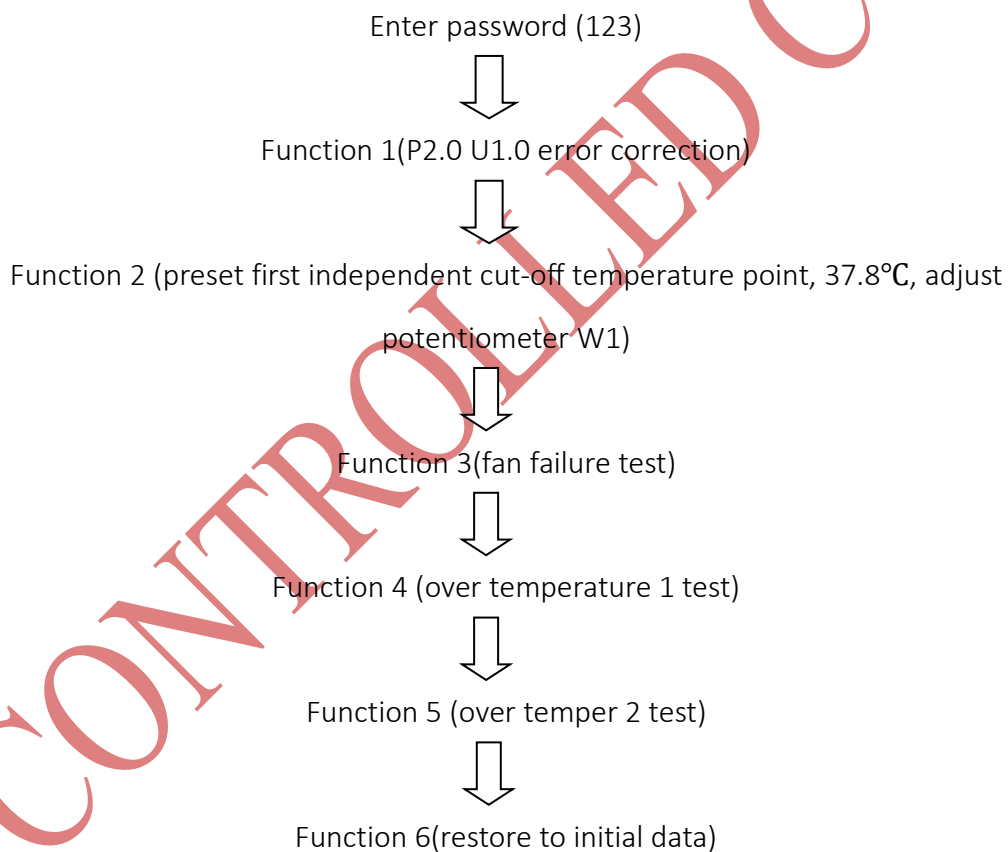
In "menu" condition, when screen shows "PR-",  press key to quit the operation.

4.3.6. Adjust of independent cut off temperature

Press lock key few seconds...enter password 123....into menu 2, air temperature display power board (independent cut-off) over temperature 2, alarm temperature is 39.8, adjust the potentiometer (W1) can change the independent cut-off temperature. The air temperature display show independent cut-off temperature value, after adjust press lock key back to menu, press lock key quit the operation.



4.3.7. Menu operation procedure as follows:



4.3.8. Failure over temperature protect instruction

- 1) Over temp 1 circuit, over temp protect is set as $\leq 37.8^{\circ}\text{C}$; over temp2 (independent circuit) protect as $\leq 39.8^{\circ}\text{C}$
- 2) When air temperature is set as $\leq 37.0^{\circ}\text{C}$

Main control circuit alarm at $\leq 37.8^{\circ}\text{C}$

Independent circuit alarm at $\leq 39.8^{\circ}\text{C}$

3) When air temp is set as $> 37.0^{\circ}\text{C}$

Main control circuit alarm at $\leq 39.5^{\circ}\text{C}$

Independent circuit alarm at $\leq 39.8^{\circ}\text{C}$

4.3.9. System alarm:

4.3.9.1 Summary

For offer a humidity and temp all well incubator for patient, during the use and maintain this equipment, if have failure will inform user in time, make them take effect action, reduce or avoid the damage to patient, equipment have 7 alarm state (chart 4-1) as follows, divide into physiology alarm condition and technology alarm condition:

a) Physiology alarm state have : skin temp deviation alarm

b) Technology alarm state have: power failure alarm, system alarm, sensor alarm, over temp alarm, fan alarm, low voltage alarm and air temp deviation alarm.

Alarm state		State description	Note
Power failure alarm		When equipment power switch and control switch all is switch on, if have AC power outage then convert to DC power supply, and DC power interruption too, system will have at least 10 minutes audible an visual alarm, or still to power is normal.	Built-in battery alarm, press "audio paused" can paused the voice alarm and it will auto reset alarm in 3 minutes, visual alarm can't stop
Deviation alarm	Air temp deviation alarm	Air temp control (require set temp at least higher than ambient temp 3°C), after temp stabilization, if test temp and set temp differ more $\pm 3^{\circ}\text{C}$, incubator will have audible and visual alarm, remind operator take action. If higher 3°C , system auto cut off heating power.	Press "audio paused", alarm will paused, it will auto reset alarm in 10 minutes, visual alarm can't stop

	Skin temp deviation alarm	Skin temp control, put skin temp sensor on the top of baby's abdomen ,set temp closed to baby skin temp, after temp stabilization, if test temp and set temp differ more $\pm 1^{\circ}\text{C}$, incubator will have audible and visual alarm, remind operator take action. If higher 1°C , system auto cut off heating power.	
Sensor alarm		Air temp sensor appear open circuit or short circuit, equipment have audible and visual alarm, and cut off heating power.	
Fan alarm		No matter what circumstances, fan stop working or fan sensor system have failure, equipment auto have audible and visual alarm and cut off heating power.	
Over temp alarm		<p>1) When air temp control mode, set temp at below 37°C, after temp stabilization, if appear temp reach 38°C, equipment will have audible and visual alarm and cut off heating power.</p> <p>2) When air temp control mode, set temp at $37^{\circ}\text{C} \sim 38^{\circ}\text{C}$, after temp stabilization, if appear temp reach 39°C, equipment will have audible and visual alarm and cut off heating power.</p> <p>3) When skin temp control mode, set temp at $32^{\circ}\text{C} \sim 38^{\circ}\text{C}$, after temp stabilization, if appear temp reach 39°C, equipment will have audible and visual alarm and cut off heating power.</p>	Press "audio paused" can paused sound alarm, it will auto reset alarm in 3 minutes, visual alarm can't stop, should start again then can reset normal state

	4) When the air temp at 39.5-40°C, no matter what control model, equipment will have audible and visual alarm and cut off heating power.	
System alarm	No matter what situation, when the built-in battery temp close to 70°C, equipment will have audible and visual alarm and cut off heating power	Press "audio paused" can paused sound alarm, it will auto reset alarm in 3 minutes, visual alarm can't stop, when temp reduce to below 53°C, alarm auto remove.
Low voltage alarm	When equipment supply power by built-in or external DC power, if the voltage of built-in power or external DC power under its about 10%, equipment will have audible and visual alarm and cut off heating power.	Press "audio paused" can paused sound alarm, it will auto reset alarm in 3 minutes, visual alarm can't stop, when voltage is normal or connect AC power, alarm auto remove.
Alarm state confirm summary	1. When equipment have blew alarm, and the "outage" red indication light bright on the control plate, other digital display and indication all not bright, equipment into "power outage" alarm state.	Outage average alarm state delay 1 second, average alarm single have delay 1 second, operator at front of equipment in 1 meter
	2. When equipment have "beeps" sound alarm, control plate except "sensor red indicator flash, other alarm indicator all not bright, air temp display screen show "Err", skin temp display screen and temp set screen normal, shows into "air sensor failure" state.	Air temp max alarm state delay 3 second, max alarm sign have delay 1 second, air temp average alarm state delay 2 second, average alarm sign delay 1 second

	<p>3. When equipment have “beeps” sound alarm, control plate except “sensor red indicator flash, other alarm indicator all not bright, skin temp display screen show “Err”air temp display window and temp set window is normal, shows into “skin temp sensor failure” state.</p> <p>4. When equipment have “beeps” sound alarm, control plate except “sensor red indicator flash, other alarm indicator all not bright, if skin temp display screen and air temp display screen all show “Err”, means into “skin temp sensor and air temp sensor failure” state.</p>	<p>skin temp max alarm state delay 3 second, max alarm sign have delay 1 second, skin temp average alarm state delay 2 second, average alarm sign delay 1 second</p> <p>Operator at front of equipment in 1 meter.</p>
	<p>5. When equipment have “beeps” sound alarm, control plate except “system” red indicator flash, other alarm indicator all not bright, skin temp display screen and air temp display screen is normal, temp set window shows “Er.1” means into system alarm state.</p>	<p>system max alarm state delay 3 second, max alarm sign have delay 1 second, system average alarm state delay 2 second, average alarm sign delay 1 second</p> <p>Operator at front of equipment in 1 meter.</p>
	<p>6. When equipment have “beeps” sound alarm, control plate except “low voltage” red indicator flash, other alarm indicator all not bright, skin temp display window, air temp display window and temp set window all is normal, means into system alarm state.</p>	<p>Low voltage max alarm state delay 3 second, max alarm sign have delay 1 second, low voltage average alarm state delay 1 second, average alarm sign delay 1 second</p> <p>Operator at front of</p>

		equipment in 1 meter.
	7. When equipment have “beeps” sound alarm, control plate except “fan” red indicator flash, other alarm indicator all not bright, temperature display window and set window digital tube all not bright, shows into “fan failure” state.	fan max alarm state delay 16 second, max alarm sign have delay 1 second, fan average alarm state delay 12 second, average alarm sign delay 1 second, operator at front of equipment in 1 meter.
	8. When equipment have “beeps” sound alarm, control plate except “over temperature” red indicator flash, other alarm indicator all not bright, air temp display window shows high real temp value, equipment into “over temp” state.	Air temp over temp max alarm state delay 3 second, max alarm sign have delay 1 second, air temp over temp average alarm state delay 2 second, average alarm sign delay 1 second, skin temp over temp max alarm state delay 3 second, max alarm sign have delay 1 second, skin temp over temp average alarm state delay 2 second, average alarm sign delay 1 second Operator at front of equipment in 1 meter.
	9. When equipment have “beeps” sound alarm, control plate except “deviation” green indicator flash, other alarm indicator all not bright, equipment into “deviation” alarm	Air temp deviation max alarm state delay 1.5 second, max alarm sign have delay 1 second, air temp deviation

	<p>state. Air temp control mode alarm, range is differ $\pm 3^{\circ}\text{C}$, skin temp control mode, range is differ $\pm 1^{\circ}\text{C}$, if corresponding display temp and set temp is positive value is positive deviation, otherwise is negative deviation.</p>	<p>average alarm state delay 1 second, average alarm sign delay 1 second.</p> <p>Skin temp deviation max alarm state delay 1.5 second, max alarm sign have delay 1 second, skin temp deviation average alarm state delay 1 second, average alarm sign delay 1 second.</p> <p>Operator at front of equipment in 1 meter.</p>
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Chart 4-1

4.3.9.2 Check the alarm system if normal or not

When re-installation incubator after disassembly parts for cleanout or maintain every time, user should inspected incubator alarm system, to see if normal or not, inspection way please reference part 4.3.10

4.3.9.3 The priority of alarm state.

According to the standard and requirement of "IEC60601-1-8", alarm system of the equipment except must have visual alarm, need audio alarm too, to ensure patient safety.

Priority of incubator alarm state and sign (chart 4-2)

Alarm state	preferential	Visual alarm		Audio alarm	
		color	Flash rate (Hz)	Pulse count of a pulse crowd(Hz)	Interval of a pulse crowd (S)
Power failure	high	red	2	10	5
Over temp	high	red	2	10	5
System	high	red	2	10	5
Low voltage	high	red	2	10	5
Air temp	high	red	2	10	5

and skin temp sensor failure					
Fan fault	high	red	2	10	5
Temp deviation	low	green	Bright steady	2	20

4.3.10 Examination of the function

Every time when re-installation incubator after disassembly parts for cleanout or maintain, should inspection incubator function, ensure incubator normal work.

The inspection of alarming for power failure

Before the equipment plug insert in the AC power, pull out the 20A fuse in the right side ,turn on power switch of control, the indicator of "power failure" and audio and visual will alarm, pull in the fuse, the alarm will be removed.

The examination to conversion of the air temp control mode and the skin temp control mode

After starting the machine, the instrument is under the air temperature control mode. When it is needed changing to the skin temperature control mode, press "key" button, press the skin temp "set" button. When the indicator of the skin temperature is bright, press "key" button for few seconds, the indicator of the skin temperature is from glittering to permanent bright, it is to enter the skin temp control mode.

If it is from skin temp control mode to the air temp control mode, the method is similar to above.

The alarm of skin temp sensor

Under the skin temperature control mode, pull out the skin temperature sensor, the equipment will give out alarm with sound and light, insert skin temperature sensor again, the equipment will return to the normal state.

The alarm of temp deviation

Set the air temp to 35°C, after temperature is constant, opened the equipment's front door, make the temperature of baby compartment drop, when it is lower than

32°C ,the equipment will give out alarm with sound and light . Close the front door, after resuming in temperature, the alarm for temp deviation will be silent automatically. When it is from air temp control mode to skin temp control mode, set the skin temp to 35°C.after the temp is constant, put the skin temp sensor in the water of 34°C and 36°C separately, the equipment will give out alarm with sound and light, After resuming in temperature, the alarm for temp deviation will be audio pause automatically.

The alarm for over temp

Set the air temp to 35°C. Press the “key” button of the incubator for seconds, the air temperature setting window shows "0--" and the first character glitters. Press the “increase” (or “decrease”) button and press the “set” button until the air temperature setting window shows "123" then press the “key” button again and the window will show "Pr- ". Press the “increase” (or “decrease”) button to select "Pr.4", press “key” button, air temp set show “OFF”, press air temp “increase” , show change to “ON”, then press the “key” button twice, it will enter the test state of over temperature (alarm indicator of over temp is slowly glitter). When the air temp rise to 38°C in temperature, will have audio and visual alarm ,at the same time switch off the heated power automatically . after the temperature lower than 37°C, press the "reset" button, the state will be removed.

The alarm of the second cut-out temp

Set the air temp to 37.5°C and make the controller in loss control state. When the air temp rise to 40°C in temperature, the alarm of over temp will sound and light and turn off the heated power automatically. Restart it when the temp is lower than 37°C, Restart it ,the test state will be removed.

The alarm of fan failure

Let the fan stop working for 17 seconds, and then the alarm will sound and light and stop heating. And the alarm will be removed when the fan starts to work. (Don’t let the fan stop working for too much time, or the component will be damaged.)

The alarm of low voltage

When equipment supplied power by built-in or external DC power,if the voltage is

low,equipment will have audible and visual alarm and cut off heating power.when connect the AC power,alarm will be removed.

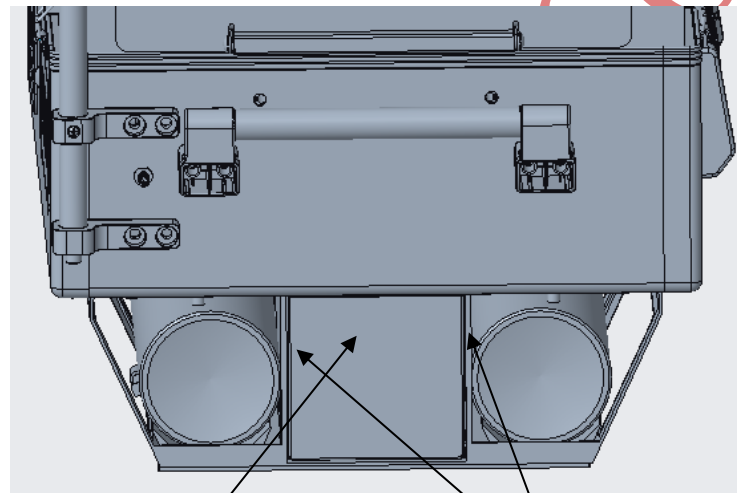
The alarm of system

No matter what situation,when the built-in battery temp close to 70°C,equipment will have audible and visual alarm and cut off heating power,when the temp of battery low than 53°C,alarm will be removed.

4.4. Use of Battery box and storage box of Infant incubator (transport)

1) Battery box

The battery box is at the middle of the oxygen cylinder holder, as shown in the figure a below. It is forbidden to open battery box unless specialized person.



Incubator's battery box cover

Cover fixed screws

Fig. a

a. Open battery box:Remove the fixing screws on both sides of the cover with the screwdriver and open the battery cover down.

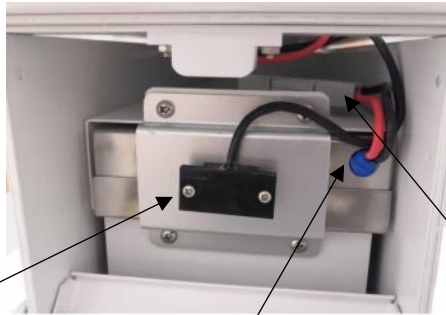
b. Connect the battery connector: The battery connector is shown in Fig. b. After connecting the battery plug and connector to the position (as shown in Fig. c), the connector is placed on the upper part of the battery (as shown in Fig. d).



Fig.b



Fig.c



Battery temperature sensor

The lithium battery

Battery connector

c. Close the battery box: After the battery temperature sensor and connector wires are well regulated, cover the battery cover and tighten the fixing screws on both sides.

2) Storage box

The transform incubator has a built-in storage box, which is convenient for users to store small articles and car power cords. The storage box is at the middle of the oxygen cylinder holder, as shown in the figure below.



Incubator's storage box

Spin lock of the incubator's storage box

- A. Opening of storage box: press the spinlock and turn it 90° clockwise or anticlockwise and then draw it to open (notice: in the spinlock there is a circular groove which is used to indicate the state of the storage box. When the circular groove is above the spinlock circle center, the storage box is in lock state; when the spinlock is at the left or right of the spinlock circle center, the spinlock is in open state).
- B. Locking of storage box: press the spinlock and turn it 90° clockwise or anticlockwise to locate the spinlock circular groove above the spinlock circle center, and thus to lock the storage box.

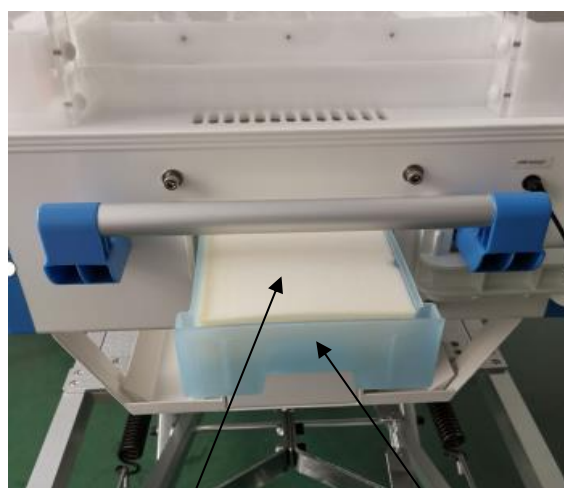
4.5. Use of water trough

The Infant incubator (transport) is furnished with humidifying equipment, which prevents the air in the incubator from being too dry. This Infant incubator (transport) has humidifying equipment, but the control panel has no humidity display, so that this Infant incubator (transport) has no humidity control function.

When the ambient temperature is 24°C and the ambient air humidity is not less than

40%RH, this Infant incubator (transport) can keep a humidity more than 50%RH.

The humidifying equipment of the Infant incubator (transport) is a humidifying sponge, which is located beneath the crib, as shown in the figure below.



Humidifying sponge

Water trough

Method of using humidification box

- A. Pull the water trough to a suitable position. (As shown in Figure)
- B. Pour distilled water into water trough slowly to soak the sponge. Add water until the sponge is close to saturation. Pay attention:
 1. The water volume can't be too much. And the flowing water can't appear above and below the sponge to avoid the overflow during the transportation and damage the equipment.
 2. In the process of transportation if the sponge is too dry, please add water in time to ensure that the humidity of the air in the incubator is suitably.
- C. Push the water trough to humidify the incubator.

Notice: Push the water trough to the right position to avoid the overflow during the transportation and damage the equipment or result in the alarm because the temperature can't reach the setting temperature.

4.6. Fixing of infants in Infant incubator (transport)

The Infant incubator (transport) provides methods of fixing infants in transport to

avoid infants getting hurt in transport by jolt.

They are as follows:

- A. Pull out and rotate the door hook pressing on the side door to open the side door.
- B. Move the crib mattress and a hole in the side of the crib can be seen; then insert the hook of the band fixing infants provided with the equipment into the hole in the crib side.
- C. Place the infant at a proper position, and fasten the velcro tap of infant band. Be careful that the tightness of the band is not too high. Then finish the fixing.

Notice: pay a regular check to the hook protector. The band hook must use cotton fabric to provide safety isolation protection. Do not let the infant contact metal parts so as to avoid doing harm to the infant's skin!

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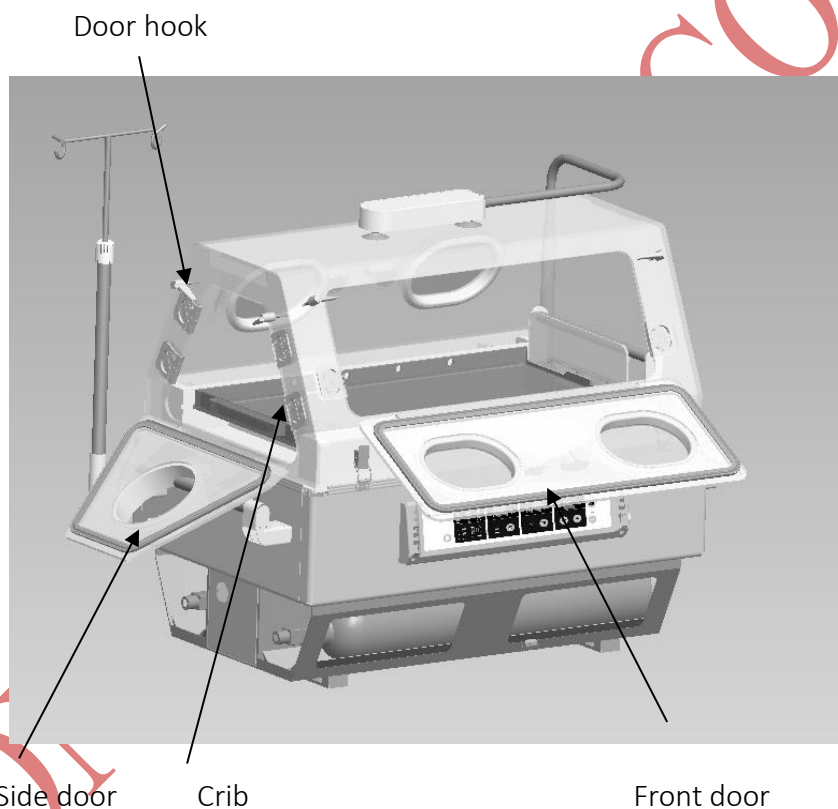
Chapter V CLEANING AND MAINTENANCE

5.1 Cleaning and disinfection

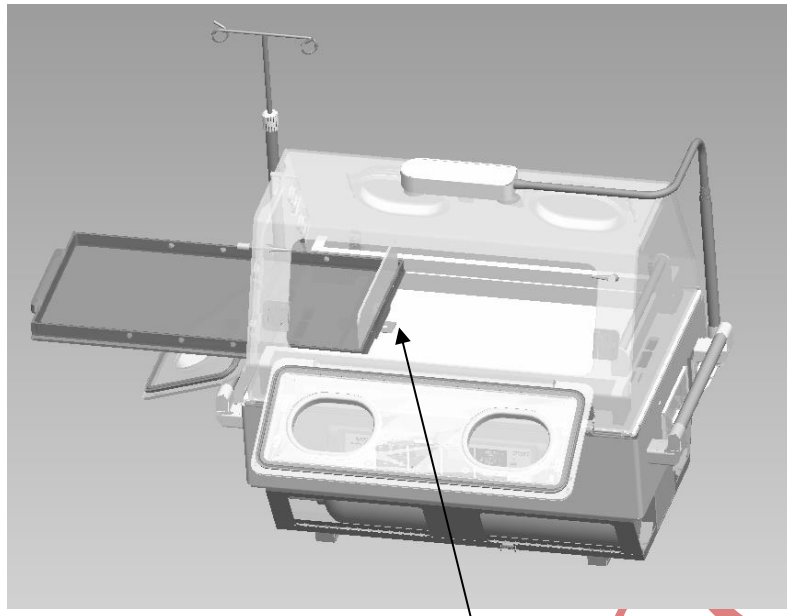
The Infant incubator (transport), when finishing transferring an infant, must be thoroughly cleaned and disinfected to avoid cross infection.

5.1.1. Cleaning of crib

- A. Pull out and rotate the door hook pressing on the side door to open the side door.
- B. Pull out and rotate the door hook pressing on the right front door to open the front door, as shown in the figure below.



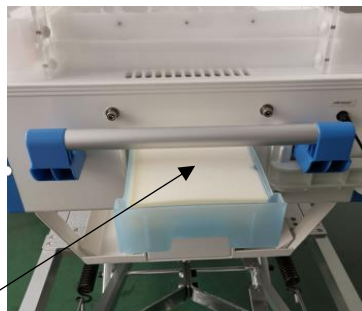
- C. Pull out the crib to the position limiting clamp, and then press down the limiting clamp to take out the crib entirely, as shown in the figure.
- D. Use clean disinfectant to thoroughly wash the crib surfaces and then dry them with a piece of clean cloth; take off the mattress cover for change or washing, and then put it on again.



Crib position limiting clamp

5.1.2. Cleaning and disinfection of humidification box and humidifying sponge

- A. Pull the water trough to the right position.
- B. Take out sponge.
- C. After cleaning it with a neutral cleaner, soak the sponge in mild disinfectant for 10 minutes.
- D. Take out wet sponge, and clean it with distilled water to remove residual disinfectant.
- E. clean inner and outer surfaces of the water trough with a mild disinfectant and then wipe dry it with a clean cloth.
- F. put back the sponge into the trough and put the trough into the incubator. And the cleaning is done.



Humidifying sponge

5.1.3. Cleaning of thermostatic cover and its seal ring

- a. The light is connected with flexible metallic tube at the top of the thermostatic cover, so that it shall be first removed before the thermostatic cover is taken down.
- b. Press down the catch auto-lock mechanism of the thermostatic over to take off the outer shell of the cover, as shown in the figure.
- c. Take off the inner shell of the thermostatic cover.
- d. Use disinfectant to thoroughly wash all the surfaces, including door corners, door edges, and then wipe them up with soft cloth. Do not use organic solvent like alcohol to scrub the thermostatic cover. Do not expose the thermostatic cover to the direct ultraviolet radiation.
- e. Take down the ring seal from the organic-glass thermostatic cover; wash it up with detergent and then dry it.



Thermostatic cover fixing catch

Fixing catch auto-lock mechanism

Thermostatic cover

5.1.4. Cleaning of crib bracket

- A. Press down the fixing catch auto-lock mechanism of the crib bracket to take down the crib bracket, as shown in the figure below.
- B. Use the cleaning disinfectant to wash all the surfaces and then dry them with clean cloth.



Bracket

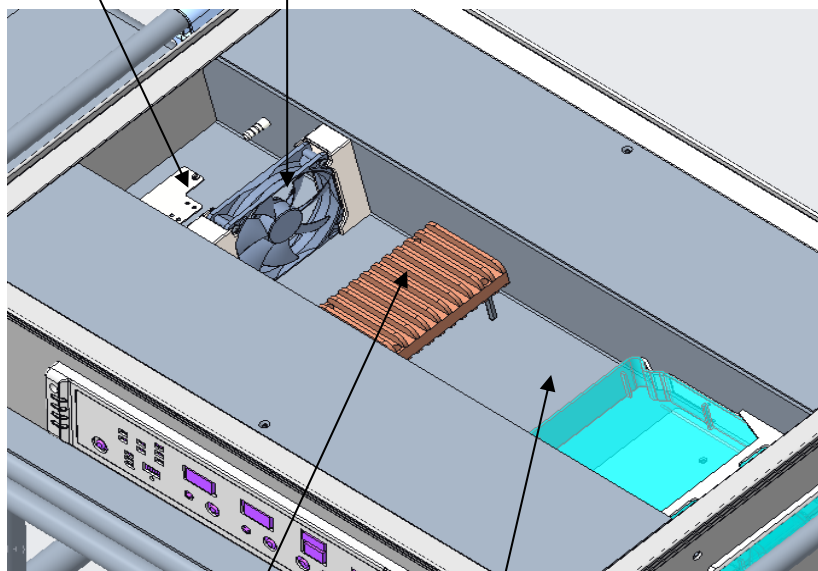
5.1.5. Cleaning of air circulation passage, fan and air temperature sensor

- A. Take down the crib bracket, exposing the air passage and fan.
- B. Clean all the air passage surfaces with cleaning disinfectant and then dry them with a piece of clean cloth.
- C. Clean all surfaces of the holder of the water trough with the disinfectant to, then dry it with a clean cloth.
- D. Clean the surface of air temperature sensor with the disinfectant (Note: Graze the surface gently to avoid damage), then dry it with a clean cloth.
- E. Clean the surface of the heater with the disinfectant when the heater cools down (Note: the temperature of the heater is very high, clean the heater after the machine is shut down for at least 45 minutes to avoid burns) then dry it with a clean cloth.
- F. Clean the inner and outer surfaces of the fan with the cleaning disinfectant and then dry it with a clean cloth.



The heater is hot, so it cannot be cleaned unless it is shut down to cool down for 45min, or scald will be caused.

Air temperature sensor Fan



Heater

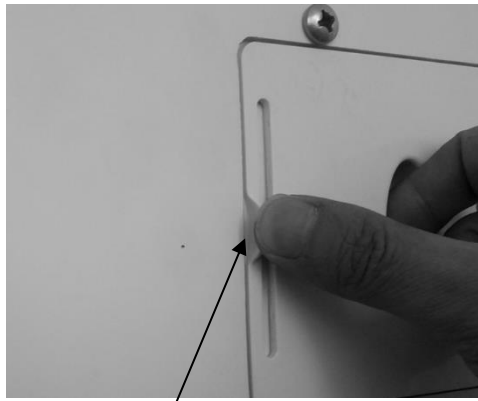
Air passage

5.1.6. Cleaning and change of air purification filter cloth

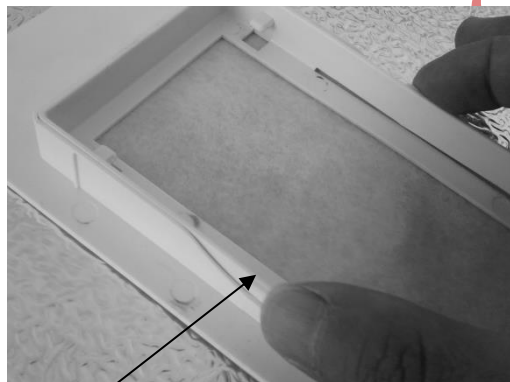
- A. Press the lock on the cover of the air filter box to open the air filter box on the back of the Infant incubator (transport).
- B. Press the plate upon the air filter cloth to remove the filter cloth.
- C. Clean the air filter box with the disinfectant cleaner, then dry it with a clean cloth.
- D. There will be wrinkle and damaged phenomena, when the filter cloth wash too much times. Change the filter the cloth in time.
- E. Press one side of the cover of the air purifier box into the air purifier box first and then the other side into the air purifier. The cleaning is done.



The filter cloth must be the dedicated filter cloth we provide, or it will fail to achieve air filter effect or the carbon dioxide concentration in the incubator will be over standard.



The lock catch for the cover of the air filter box



The catch for the air filter plate

5.1.7. Cleaning of skin temperature sensor

Clean the surface thoroughly with disinfectant and dry it with clean cloth.

5.1.8. Cleaning of wheels

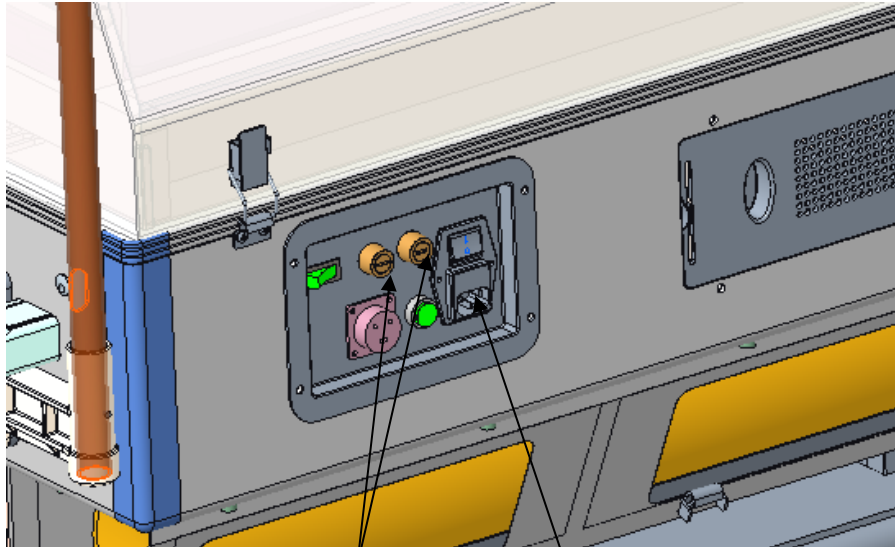
Clean the surfaces thoroughly with disinfectant and dry them gently with clean cloth.

5.2. Maintenance

5.2.1. Change of the fuses

A. The fuse holder of the incubator is at the back of the incubator's control cabinet.

B. Unplug the power cord and unscrew the cartridge fuse cap on the holder with a screwdriver to change for a $\phi 5 \times 20 \text{ mm}$ F 20A cartridge fuse.



fuse holders

Power socket (with fuse box)

5.2.2. Change of fuse in power socket

- A. Use a small slot type screwdriver to prize the power socket's fuse box, as shown in the figure below.
- B. Use a small slot type screwdriver to insert the power socket's fuse box from under and push the fuse out, as shown in the figure below.
- C. Replace it with a $\phi 5 \times 20$ mm T3AL 250V cartridge fuse.



Pull out the power socket's fuse box with a mall slot type screwdriver



Push-out the fuse by 2 side



The incubator shall be maintained by professionals. The power cord plug must be unplugged when maintenance is being carried out.

5.2.3. Battery parameter and maintenance

A. Basic technical parameter of battery

Battery capacity: 40Ah.

Outside dimension of battery (L×W×H): 330×130×42 (Unit: mm)

Battery weight: 3.4Kg

Battery's charging environment temperature: 0°C~40°C

Battery's discharge environment temperature: -10°C~45°C

B. Battery features and notices of maintenance

- (1) The Infant incubator (transport) has lithium ion battery as its main battery. As lithium ion battery has no memory effect, the battery of the incubator allows clients to charge up it when the battery level is low, so as to avoid occurrence of low battery level in long-distance transport.
- (2) To protect battery and the charger, the charger switch shall be immediately closed after the battery is fully charged up.
- (3) When it is necessary to leave the battery unused for a period of time, please let the battery level stay at 50% to protect it.

-
- (4) Batteries are consumables. The main battery of the Infant incubator (transport) is ternary lithium-ion battery. The number of full charge-discharge cycle of the battery is up to 500. When the battery's cycle life expires, please apply to our after-sales department or our authorized service providers for replacing the battery. The company shall be not responsible for any accident resulting from refitting of our battery and unauthorized change with other companies' battery.
- (5) Batteries in themselves are hazardous articles. The superseded batteries shall be not discarded at random; batteries shall be not placed near a heat source (for example fire or heater); batteries shall be not thrown into a fire or wetted; batteries shall be not put into a fire or heated; batteries shall be not short circuited between the positive and the negative by wires or other metallic objects; batteries shall be prevented from being pierced through their shell by nails or other sharp articles; batteries are not permitted to be hammered, trampled or thrown; batteries are not permitted to be resolved in any way. The battery that is replaced shall be handed to our after-sales service personnel or our authorized service providers for disposal.

Chapter VI REMOVAL OF COMMON FAULTS

Fault phenomenon	Cause analysis	Handling method
Power failure alarm	<ol style="list-style-type: none"> 1. The power socket is in poor contact. 2. The power fuse is burnt out. 3. The lines in the control cabinet are in poor contact. 	<ol style="list-style-type: none"> 1. Repair or change the power socket 2. Change the fuse 3. Invite professionals to repair
Over-temperature alarm	<ol style="list-style-type: none"> 1. The temperature sensor is damaged. 	<ol style="list-style-type: none"> 1. Change the temp sensor
Deviation alarm	<ol style="list-style-type: none"> 1. The temperature in the incubator which is only just started is low. 2. The front door of the thermostatic cover is opened too long. 3. When the incubator temperature is high, a low temperature is set. 	<ol style="list-style-type: none"> 1. Reset, and wait 2. Close the incubator door, and reset and wait 3. Reset, and wait
Sensor alarm	<ol style="list-style-type: none"> 1. The skin temperature sensor is not plugged in skin temperature control mode. 2. The sensor plug comes off or has poor contact. 3. The sensor suffers broken circuit, short circuit or damage. 	<ol style="list-style-type: none"> 1. Plug the skin temperature sensor 2. Fit the sensor well 3. Connect the broken line or change the sensor

Out-of-control operation of set key	The key button is poorly contacted or damaged.	Check the key and make treatment accordingly.
No work of temperature display	The sensor is not plugged or the sensor circuit is disconnected.	Check the sensor and connect it.
No temperature rise while the heating indicator is on	The heater is damaged.	Change the heater

Chapter VII AFTER-SALE SERVICE

Dear Users:

Thank you for using the medical equipment products that made by our company; please keep this maintenance properly. Products such as defective in quality or breaking down will go on guarantee or maintenance by this list.

The list of maintenance

Name: Infant incubator transport		Model: BT-100	
Date of production:	Date of purchasing machine:	Type:	
Applying company:		Postcode:	
Address:		Tel:	
Suggestion of applying company	Date:		
Handling suggestion	Date:		

The medical equipment products which our company produced, guarantee in two years, and maintain all its life (except being damaged artificially), if the products cannot reach technical indicator or other quality problems, please send "The list of maintenance" to the service department after sale of our company to solve according to the regulation.

Chapter VIII FOLLOW-UP

Dear users:

The manual is suitable for the incubator of BT-100 to install, use, wash and maintain, users should use the products according to this manual.

All relevant staff members should operate the products after reading manual carefully, if still having some puzzle, please contact with our company in order to offer detailed materials.

All this manual data, picture are according to the newest products while publishing, because of improving or other reason, there maybe some differences between this manual's description and the real product, please forgive!

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